OFFICIAL PUBLICATIONS OF CORNELL UNIVERSITY

VOLUME III NUMBER 7

ANNOUNCEMENT OF THE TWENTY-FIRST SUMMER SESSION JULY 6-AUGUST 16 1912

APRIL 1, 1912
PUBLISHED BY CORNELL UNIVERSITY
ITHACA, N. Y.

This announcement is intended to give detailed information to prospective students in the Summer Session of Cornell University.

For general information concerning the University and the work in its various colleges during the academic year, the requirements for admission, etc., the General Circular of Information should be consulted. This and the other Official Publications of Cornell University are listed on the last page of the cover of this pamphlet. Any one of the informational publications there mentioned will be sent gratis and post-free on application to The Registrar of Cornell University, Ithaca, N. Y.

CALENDAR
SUMMER SESSION 1912

In order to get the full number of exercises announced for the Summer Session, it is necessary that all work begin promptly on Monday morning, July 8. Students are therefore urged to reach Ithaca in time to be present at the first exercises in each class. If possible, they should register on Saturday, July 6; if not, they should register on Monday during the hours not occupied in class work.

July 6, Saturday,	9 a. m. to 5 p. m. Registration at office of Registrar.
July 8, Monday,	Instruction begins at times and places announced under each course. Registration continued.
July 9, Tuesday evening, and following Tuesdays,	Musical Recital, Sage Chapel. The Director of the Summer Session will make a brief address.
July 10, Wednesday evening, and following Wednesdays,	Departmental Conferences.
July 11, Thursday evening, and following Thursdays,	Musical Recital, Sage Chapel.
July 13, Saturday before 1 p. m.	Last day for the payment of fees at the Treasurer's Office, 1 Morrill Hall. Excursions as announced in the weekly calendar.
July 15, Monday evening,	First Lecture in Monday evening course. Continued on following Mondays. Rockefeller Hall.
August 15, 16, Thursday and Friday,	New York State Examinations for Teachers' Certificates.
August 16, Friday,	Summer Session closes.

A weekly calendar is published by the University. During the Summer Session it will be mailed to any address on receipt of twenty-five cents at the Registrar's Office.

CALENDAR
ACADEMIC YEAR 1912–13

September 13, Friday,	Entrance examinations begin.
September 23, Monday,	Academic year begins. Registration of new students. Scholarship examinations begin.
September 24, Tuesday,	Registration of new students.
September 25, Wednesday,	Registration of old students.
September 26, Thursday,	Instruction begins. President's annual address to the students.

CORNELL UNIVERSITY, SUMMER SESSION 1912

OFFICERS

Jacob Gould Schurman, LL.D., President of the University.
George Prentice Bristol, A.M., Director of the Summer Session.
David Fletcher Hoy, M.S., Registrar of the University.

FACULTY

The members of the faculty are, except where the contrary is indicated, regular members of the Cornell University staff of instruction.

Arthur J. Abbott, Director of Music, Buffalo.	Music
Joseph Quincy Adams, jr., Ph.D., Assistant Professor of English.	English
Ross Peter Anderson, A.B., Assistant in Chemistry.	Chemistry
Elmer James Bailey, Ph.D., Instructor in English.	English
John Wallace Baird, Ph.D., Assistant Professor of Psychology, Clark University.	Psychology
James F. Barker, M.E., Principal East Technical High School, Cleveland, Ohio.	Industrial Education
John Bauer, Ph.D., Assistant Professor of Economics.	Economics
Nels A. Bengston, Assistant Professor of Geography and Geology, University of Nebraska.	Geography
Charles Edwin Bennett, Litt.D., Professor of Latin.	Latin
Ernest Blaker, Ph.D., Assistant Professor of Physics.	Physics
Albert Wilhelm Boesche, Ph.D., Assistant Professor of German.	German
Frank David Boynton, Pd.D., Superintendent of Schools, Ithaca.	Education
Julian Pleasant Bretz, Ph.D., Professor of American History.	History
Leslie Nathan Broughton, A.M., Ph.D., Instructor in English.	English
Harry Philip Brown, A.M., Instructor in Botany.	Botany
Arthur Wesley Browne, Ph.D., Professor of Chemistry.	Chemistry
Howard W. Brubaker, Ph.D., Honorary Fellow in Chemistry.	Chemistry
Laura Bryant, Director of Music, Ithaca Public Schools.	Music
Walter Butterfield, Director of Music, Manchester, N. H.	Music
Walter Buckingham Carver, Ph.D., Assistant Professor of Mathematics.	Mathematics
George Evert Condra, Ph.D., Professor of Geography and Economic Geology, University of Nebraska.	Geography
Clyde Firman Craig, Ph.D., Instructor in Mathematics.	Mathematics
George Irving Dale, A.B., Instructor in Romance Languages.	French
Hollis Ellsworth Dann, Mus.D., Professor of Music.	Music
Merritt James Davis, Assistant in Chemistry.	Chemistry
Charles DeGarmo, Ph.D., Professor of Education.	Education
Donald Derickson, C.E., Assistant Professor of Civil Engineering.	Civil Engineering
Edgar Arnold Doll, A.B., Assistant in Psychology, University of Wisconsin.	Psychology
George Matthew Dutcher, Ph.D., Professor of History, Wesleyan University.	History

William Henry Elson, A.M., Sometime Superintendent of Schools, Cleveland, Ohio. Education
George Abram Everett, LL.B., Assistant Professor of Oratory. Public Speaking
Lew Dwight Fallis, Instructor in Public Speaking. Public Speaking
John Gaub, B.Sc., Assistant in Chemistry. Chemistry
Roswell Clifton Gibbs, A.M., Instructor in Physics. Physics
Ralph J. Gilmore, Instructor in Zoology. Zoology
Arthur Gordon, Ph.D., Assistant Professor of Romance Languages. Spanish
J. Earl Griffith, Department of Art, Central Commercial and Manual Training High School, Newark, N. J. Industrial Education
Othon Goepp Guerlac, Licencié ès lettres, Assistant Professor of Romance Languages. French
John Jerome Hayes, Teacher of Singing, New York City. Music
Walter Liston Head, Foreman of Forge Shop. Manual Training
Arthur Romaine Hitch, A.M., Assistant in Chemistry. Chemistry
Emmet Francis Hitch, A.M., Instructor in Organic Chemistry. Chemistry
Leroy Hooper, Foreman of Wood Shop. Manual Training
Arthur Earl Houlehan, Ph.D., Assistant in Chemistry. Chemistry
Harley Earl Howe, M.A., Instructor in Physics. Physics
Andrew Hunter, M.A., Assistant Professor of Biochemistry. Physiology
Wallie Abraham Hurwitz, Instructor in Mathematics. Mathematics
John Irwin Hutchinson, Ph.D., Professor of Mathematics. Mathematics
Edward Francis Johnston, University Organist. Music
Horace Leonard Jones, Ph.D., Assistant Professor of Greek. Latin
Edwin Walter Kemmerer, Ph.D., Professor of Economics and Finance. Economics and Finance
Dexter Simpson Kimball, A.B., Professor of Machine Design and Construction. Industrial Education
Burton Judson Lemon, A.B., Instructor in Chemistry. Chemistry
Gustav Ernst F. Lundell, Ph.D., Instructor in Chemistry. Chemistry
William Judson Marsh, A.B., Assistant in Chemistry. Chemistry
Harry Welday Mayes, B.S., Instructor in Physiology and Biochemistry. Physiology
Fred McAllister, Instructor in Botany. Botany
Edwin Eugene McCready, Supervisor of Manual Training, Syracuse, N. Y. Industrial Education
Joseph Vance McKelvey, Ph.D., Instructor in Mathematics. Mathematics
Fred A. Molby, A.M., Instructor in Physics. Physics
George Sylvanus Moler, B.M.E., Professor of Physics. Physics
Benton Sullivan Monroe, Ph.D., Instructor in English. English
Everett Ward Olmsted, Ph.D., Professor of Romance Languages. French
William Ridgeley Orndorff, Ph.D., Professor of Organic and Physiological Chemistry. Chemistry
Walther Otto, Ph.D.. Oberlehrer am Alten Gymnasium, Bremen. German
Frederick William Owens, Ph.D., Instructor in Mathematics. Mathematics
Irving Perrine, A.B., Associate Professor of Geology, University of Oklahoma. Geology
Miles Albion Pond, Ph.B., Assistant Professor of Civil Engineering. Descriptive Geometry
Paul Russel Pope, Ph.D., Assistant Professor of German. German

Harry Westfall Redfield, B.S., Instructor in Chemistry.	Chemistry
Hugh Daniel Reed, Ph.D., Assistant Professor of Zoology.	Zoology
Ernest William Rettger, Ph.D., Assistant Professor of Applied Mechanics.	Mechanics
Floyd Karker Richtmyer, A.B., Instructor in Physics.	Physics
Willard Winfield Rowlee, D.Sc., Professor of Botany.	Botany
Christian Alban Ruckmich, A.B., Instructor in Psychology.	Psychology
Elsie Sameth, A.B., Teacher in Goldfield, Nevada, High School.	Physical Education
Francis Joseph Seery, B.M.S., Assistant Professor of Civil Engineering.	Hydraulics
Francis Robert Sharpe, Ph.D., Assistant Professor of Mathematics.	Mathematics
John Sandford Shearer, Ph.D., Professor of Physics.	Physics
Louis Lazarus Silverman, A.M., Instructor in Mathematics.	Mathematics
Ward Brown Smith, Assistant in Machine Shop.	Manual Training
Virgil Snyder, Ph.D., Professor of Mathematics.	Mathematics
James Storrer, Assistant in Geology.	Geology
William Strunk, jr., Ph.D., Professor of English.	English
Newton Swift, Teacher of Piano and Theory, Boston, Mass.	Music
Thomas Tapper, Lecturer, Institute of Musical Art, New York City.	Music
Harvey Waterman Thayer, Ph.D., Preceptor, Princeton University.	German
Lawrence J. Ulrich, A.B., Assistant in Chemistry.	Chemistry
James Elijah Vanderhoef, Foreman in Foundry.	Manual Training
Oscar Diedrich von Engeln, Ph.D., Instructor in Geology.	Geography
Joseph Alleine Wauchope, Mechanic Arts High School, St. Paul, Minn.	Physics
Albert Edward Wells, Superintendent of Shops.	Industrial Education
Thomas Whitney Benson Welsh, A.B., Instructor in Chemistry.	Chemistry
Guy Montrose Whipple, Ph.D., Assistant Professor of the Science and Art of Education.	Education
Bernice White, Director of Music, State Normal School, Fredericksburg, Va.	Music
John Tamsh Williams, Instructor in Machine Design.	Industrial Education
Wilford Murry Wilson, M.D., Professor of Meteorology.	Meteorology
Harry Emsley Wood, Director of Manual Training, Indianapolis, Ind.	Industrial Education
Albert Hazen Wright, Ph.D., Instructor in Vertebrate Zoology.	Zoology
Wesley Daniel Zinnecker, Ph.B., Instructor in German.	German

TEACHERS IN THE OBSERVATION SCHOOL

Mary A. Dodd.	First and second grades
Catherine A. Kelly.	Third and fourth grades
Alice P. Sheffer.	Fifth and sixth grades
Fanny C. White.	Seventh and eighth grades
Laura C. Manley, A.B.	High-school subjects in seventh and eighth grades

OBJECT OF THE SUMMER SESSION

The primary object of the Summer Session is to advance education by helping those engaged in it. The instruction is adapted to the needs of the following classes.

1. Professors and teachers in colleges and schools, superintendents, and supervisors of special branches of instruction.

The announcements of the different departments show a wide range of work. This work is either advanced and therefore suited for specialists who wish to pursue their individual study, or more elementary and adapted to teachers who desire to start in a new field. In addition to the instruction of the class room, the University's libraries, laboratories, and shops are open for use. For superintendents and supervisors, there are also courses in administration, and in general and special methods, besides lectures on educational philosophy and theory.

2. College students in Cornell or other universities who wish to use some of the "long vacation". In the case of graduates some of the work offered may be counted toward an advanced degree. Undergraduates may anticipate work and thereby shorten their course, or may make up existing deficiencies. The conditions for receiving credit, and the amount which may be obtained, are stated on pages 7, 8.

3. Students entering the University and wishing to obtain surplus credit at entrance, or to complete the entrance requirements. It often happens that students have in June more or less than the requirements for admission to college. The Summer Session affords them the opportunity either to add to their surplus and thus, in some cases, to gain a year in time; or to make up their deficiency.

4. All persons qualified to pursue with profit any course given, whether or not they are engaged in study or teaching.

STATISTICS OF ATTENDANCE, 1911

The whole number enrolled in the Summer Session of 1911 was 1030 (652 men and 378 women), representing 48 states and territories and 25 foreign countries. Of this number 404 were students during the previous winter; 400 were persons engaged in teaching, of whom 41 were teachers in colleges, 13 in normal schools, 161 in high schools, 100 in grammar schools, 6 in private schools, and 79 were supervisors or superintendents.

ADMISSION, ATTENDANCE, REGISTRATION

There is no examination for admission to the Summer Session. Each person must, however, satisfy the instructor in charge of any course (unless it be elementary) that he is qualified to pursue the work. Any duly registered student of the Summer Session may visit such classes as he desires. **Admission to the class rooms is restricted to duly registered students.** Persons wishing to have work done during the Summer Session counted towards an advanced degree, must conform to the regulation stated under the heading "Credit for Work", page 7.

All students are required to register at the office of the Registrar in Morrill Hall. They may register on Saturday, July 6, between 9 a. m. and 5 p. m., or upon the day of their arrival, if they reach Ithaca later than July 6. Registration

on July 6 is urged. Class exercises begin at 8 a. m. Monday, July 8. The Registrar's office is open from 9 a. m. to 4 p. m. every day except Saturday, when it is closed at noon.

TUITION FEE

The single tuition fee for the entire Summer Session of 1912, whether one course or more be taken, is $25. Beginning with the Summer Session of 1913, the tuition fee will be $30. This must be paid at the office of the Treasurer, Room 1, Morrill Hall, within five days after registration day. In case of withdrawal, within five days from the first registration day, for reasons satisfactory to the Treasurer and the Registrar, the tuition paid may be refunded and the charge cancelled. In case of withdrawal within two weeks after the first registration day, one-half the tuition may be refunded. In case of registration after the first three weeks of the session, students must pay two-thirds of the full tuition fee. No student is admitted without the payment of this fee. Sibley College students taking shop work are not exempted. Admission to classes is restricted to duly registered students.

LABORATORY FEES

Chemistry. A fee is charged for material actually consumed, and such deposit must be made with the Treasurer as the instructor may prescribe.

Physics, Botany, Physiology. In each of these departments the fee for each term or part thereof is at the rate of $1 for every five hours a week of work in the laboratory. The entire amount must be paid to the Treasurer at the beginning of the term.

Geology. See page 44.

Geography and Geology. For course B in geography a fee of $1 must be paid in advance to the Treasurer to cover incidental expenses of the course.

Shopwork. The fee for shopwork is at the rate of $1.50 for every fifty hours spent in the shops. This must be paid in advance to the Treasurer. Students registered in Sibley College during the previous year are not required to pay this fee.

Zoology. See courses under Zoology, pages 46, 47.

Library Deposit. See under Library, page 9.

ACADEMIC CREDIT FOR WORK

In the College of Arts and Sciences. The requirements for the degree of Bachelor of Arts are residence for eight terms (four years), and the completion of one hundred twenty hours ("points") of elective work. A student who has satisfied the entrance requirements of the College, and has afterward completed in two or more summer sessions at least twelve hours of work in courses approved by the departments concerned, may be regarded as having thus satisfied one term of residence. Under no circumstances shall work done in summer sessions be accepted as the equivalent of more than two terms of residence. The maximum amount of credit towards the A.B. degree which is allowed for the work of any one summer session is seven hours.

In other Colleges of the University. The nature and amount of credit allowed in these for summer session work may be learned from the statements under the announcement of each course.

In the Graduate School. Graduate work at Cornell is not expressed in terms of courses or hours. A graduate of any college whose requirements for a first degree are substantially equivalent to those for the first degree at Cornell may be admitted to resident study in the Graduate School. He may be admitted to candidacy for an advanced degree upon the recommendation of the professors under whom he proposes to work. The conferring of the degree itself does not depend primarily on the completion of any prescribed number of courses or of a fixed term of residence. It involves the writing of a thesis and the passing of a special final examination. The minimum period of residence for the master's degree is one academic year or its equivalent, and for the doctor's degree three years.

Not all work done by a graduate student is graduate work in the strict sense of the term. Graduate work to be considered as work for a degree must be of advanced character in some field or department of knowledge.

Graduate work toward an advanced degree may be done during the Summer Session under the following conditions: it must be done under the direction of a member of the Faculty of the Graduate School, after the student has entered the Graduate School and is admitted by the Dean of the School as a candidate for an advanced degree. The residence requirement for the master's degree may be satisfied by study during five Summer Sessions, or by study during one-half the academic year and in three Summer Sessions.

The graduate work offered in the summer of 1912 may be learned from the departmental announcements. Not all departments offer graduate work.

Any person wishing to become a candidate for an advanced degree and to study during the Summer Session should write to the professor whose work he expects to take, and also to the Dean of the Graduate School, asking for a blank form of application for admission to the Graduate School. It is much better to make these arrangements before coming to Ithaca, thus avoiding delay and interruption of study after the Summer Session has begun.

Certificates for Work Done. Students of the Summer Session who are not matriculated in the University may receive certificates of attendance and of work satisfactorily performed. Application for them must be made before August 16, and the applicant must leave at the office of the Registrar a large sized envelope stamped and directed to his home address. The certificate will then be forwarded by mail. The regulations of each department for the granting of a certificate must be met.

The Department of Education of New York City will, in certain subjects, accept these certificates instead of requiring examinations for licenses.

COST OF LIVING

The cost of board and furnished room in Ithaca during the Summer Session runs from $5.50 a week upwards. In some cases the cost has been reduced to $5, or even to $4.50, but it is not safe to count upon less than $5.

The price of a single furnished room may be as low as $1 a week. The prices advance with the size and location of the rooms.

Rooms are engaged with the understanding that they will be occupied for the entire session, unless otherwise agreed upon by both parties. Table board is usually engaged by the week, or, if so stated, by the day.

The price of table board runs from $4 and $4.50 in boarding houses, to $7 and $10 at the hotels.

The University has one residence hall, the Sage College, with an annex, Sage Cottage. This will as heretofore be opened for women throughout the Summer Session. Married men accompanied by their wives may be lodged in Sage Cottage, where the first and second floors will be reserved for them. As the great majority of the persons living in these buildings are attending the University for serious work, it is necessary that the rooms and halls should be quiet during the hours of rest. Persons unwilling to conform to reasonable regulations for securing this quiet are not wanted in the buildings. The price of rooms in Sage College is from $1.25 to $5.50 a week, according to location, and of table board $5.00. The capacity of the building is usually engaged in advance, and early application is therefore advisable.

This should be made to the Manager of Sage College, Ithaca, N. Y. Every application for a room to be reserved must be accompanied by a deposit of $5, otherwise the application is not registered. The amount of this deposit is deducted from the rent if the room assigned be occupied by the applicant; it is refunded if the applicant gives formal notice to the manager on or before June 15 that she desires to withdraw the application altogether.

Without permission from the Director of the Summer Session no one will be allowed to room in Sage College or Sage Cottage during the summer unless registered in the Summer Session.

The whole expense of attendance at the Summer Session, not including laboratory fees, may be estimated at $75 to $85.

THE LIBRARIES

The University Library is open on week days from 9 a. m. to 5 p. m., except Saturday, when it closes at 1 p. m. In this are housed the main library, containing about four hundred thousand volumes, and most of the seminary and special libraries. The main reading room affords accommodations for over two hundred readers, and contains a selected library of over 8,000 volumes of reference works. Adjacent to it is the periodical room in which are kept the current numbers of about five hundred journals in various fields of knowledge. These rooms are open to all students. Students properly qualified are allowed the use of the seminary rooms and of the books in them. The main collection is primarily a library of reference for use in the building. Students are, however, allowed to a limited extent to take out books for home use. Persons wishing this privilege must make a deposit of $5, which will be refunded upon the return of all books taken out. Special libraries of chemistry, in Morse Hall, and of anatomy and physiology, in Stimson Hall, are open to students in these departments.

LECTURES, MUSICAL RECITALS, EXCURSIONS

In addition to the regular class room work there will be evening lectures on topics of general interest throughout the session.

For several years the lectures on Monday evenings have formed a course treating problems in some field of science. In 1912 they will be given by Professor J. S. Shearer on chosen topics in physics.

In addition to these there are lectures of general interest each week in connection with the various departments. Notice of these will be given in the University Calendar each week.

Musical recitals will be given on Tuesday and Thursday evenings in the Sage Chapel.

Wednesday evenings are devoted to the departmental conferences which are open to all interested. Notice of these will be given from week to week. In connection with the work of several departments excursions are made to many points of interest. Most of these are open to members of the Summer Session. Notice of them is given from week to week.

An informal reception will be held on some evening at the beginning of the Summer Session. This, it is hoped, will assist students in the Summer Session in becoming acquainted with the members of the staff of instruction and with each other.

RAILROAD ROUTES AND RATES

Ithaca is reached by either the Lehigh Valley or the Lackawanna railroad. By the latter, a branch leaves the main line at Owego. Through trains run from New York and Buffalo on the Lehigh, and through sleeping cars run daily from New York on both roads. From Philadelphia, Baltimore, Washington, and the South, via the Baltimore & Ohio, the Philadelphia & Reading connects with the Lehigh at Bethlehem. On the Lehigh, through trains for Ithaca connect with the New York Central at Auburn, and with the Pennsylvania (Northern Central) and the Erie at Elmira.

From nearly all important points in the Middle and Atlantic Coast States summer excursion tickets may be purchased to Ithaca. From central and western states it is generally possible to buy excursion tickets to Niagara Falls, in case an excursion rate to Ithaca is not available.

At the time this pamphlet goes to press it is not possible to give specific rates. Persons interested should, some time in advance of their departure, make inquiry of the railroad agent at their home town. If full information cannot be obtained in this way, write to the Director of the Summer Session, Ithaca, N. Y.

COURSES OF INSTRUCTION

Most of the courses offered consist of five exercises a week, each week day except Saturday. The number of actual hours of class work in any course may be found by multiplying the weekly exercises by six.

The word "hour" used in speaking of University credit means the equivalent of one class exercise a week for a half year. One hundred and twenty such "hours" are required of candidates for the A.B. degree

(G. S. = Goldwin Smith Hall.)

EDUCATION

Courses A, B, and C will be found especially helpful to college graduates who are preparing for examination in professional subjects as outlined in the New York State Syllabus and Course of Study for the renewal of the College Graduate Certificate Limited. The State Education Department will hold an official examination for such candidates at Ithaca, August 15 and 16. Since it is permissible to do so, those who can should prepare for examination in two subjects this summer and for the remaining two a year later.

A. **Principles of Education.** Lectures, discussions, and textbook study. Professor DEGARMO. Except Sat., 11. G. S. 142. Credit, two hours.

This course is designed to be an introduction to the general theory of education, and falls into three distinct parts, the first pertaining especially to education as an agency for securing individual and social progress; the second, to the school studies, their value and their organization into curricula for cultural and for vocational ends; and the third, to the scientific method of teaching them. The following are some of the leading topics: educational aspects of prosperity; health; political and economic democracy; home life; race improvement; social adjustment and individual and social progress; the social and the individual basis of education; the basis for the selection of studies; their classification; their function and relative educational worth; the mental discipline that each should furnish; the organization of the studies into curricula; the correlation of high-school studies; scientific basis for high-school methods; function of authority; observation and experiment, of hypothesis and analogy in getting and explaining facts; nature and function of the 'problem'; nature and place of induction and deduction in teaching; the means for securing efficiency; function of the laboratory and workshop; heuristic methods; German methods. Textbooks: DeGarmo's Principles of Secondary Education, vols. I and II; collateral reading: Principles of Education by Henderson, by Bolton, and by Roediger, respectively. Also, for elementary teachers, Bagley's Educative Process and Strayer's Teaching Process. Reference books: the McMurry Series for elementary teachers, and for secondary teachers, the Macmillan and the Longmans Series on the teaching of the respective subjects. As far as issued these are as follows.

1. The Macmillan Series: 1. English. Percival Chubb. 2. Mathematics. David Eugene Smith.

2. The Longmans Series: 1. English. Carpenter, Baker, and Scott. 2. Latin and Greek. Bennett and Bristol. 3. Mathematics. J. W. A. Young. 4. Physics and Chemistry. Smith and Hall. 5. History and Civics. Henry E. Bourne. 6. Biology. Lloyd and Bigelow.

B. **History of Education.** Lectures, discussions, textbooks, and prescribed readings. Professor DEGARMO. Except Sat., 9. G. S. 256. Credit, two hours.

This is a course in historical interpretation. It is based upon the development of thought and institutions, and the significance of each aspect is estimated from its bearings upon the educational problems of the present. Special emphasis is placed upon the following topics: the education of the Greek people; the rise and development of humanism; the rise and development of science and scientific methods in education; the doctrine of educational reformers; the development of modern systems of education, including industrial training. Textbook: Monroe's Textbook in the History of Education.

C. **Educational Psychology.** Lectures, discussions, and readings. Assistant Professor WHIPPLE. Except Sat., 10. G. S. 256. University credit, two hours.

The lectures present a system of functional psychology as applied to education, with particular reference to such topics as nervous plasticity, habit, attention and interest, instinctive response, the nature of educational training and discipline, association, perception, observation, memory, imagination, conception, judgment and reasoning. Where feasible, psychological experiments that apply to the work in hand are described or performed. Students will need for class room use Whipple's Questions in General and Educational Psychology (Cornell Study Bulletins for Teachers, No. 3, C. W. Bardeen, Syracuse, N. Y.), and will find it advisable for outside reading to purchase James's Talks to Teachers on Psychology, Henry Holt and Co., and Kirkpatrick's Fundamentals of Child Study, The Macmillan Co. Students who have had no previous work in psychology are advised to take Psychology course A also.

D. **School Hygiene.** Lectures, discussions, and readings. Assistant Professor WHIPPLE. Except Sat., 11. G. S. 256. University credit, two hours.

This course is designed to afford immediate practical assistance to all teachers, to enable them to secure and maintain hygienic conditions of instruction and to coöperate intelligently in the vitally important movement for the conservation of public health. The course has also been designed to supply superintendents with a program of work which they may follow in extending a knowledge of school hygiene among their own teachers. Attention will be paid to the schoolhouse site and grounds, the form and size of the schoolroom, illumination, heating and ventilating, sanitation, school desks, the hearing and vision of school children, the hygiene of the mouth, throat, and nose, the hygiene of reading and of writing, school diseases and accidents, sex hygiene, fatigue and overpressure, and the nature, value, and methods of medical inspection. The work will be illustrated by numerous demonstrations and opportunity will be given for practice in conducting special tests of the sense-organs. Students will need for classroom use Whipple's Questions in School Hygiene (Cornell Study Bulletins for Teachers, No. 4, C. W. Bardeen, Syracuse, N. Y.).

E. **Mental and Physical Tests of School Children.** Laboratory exercises,

readings, and discussions. Assistant Professor WHIPPLE and Mr. DOLL. Except Sat., 2–4.30. G. S. 248. Credit, two hours.

This work is planned to familiarize teachers and superintendents with the purposes, methods, and results of conducting mental and physical tests, and is particularly recommended to those interested in special classes for defectives, backward, or talented children. It affords practice in the use of the recently developed scales for measuring performance in arithmetic, writing, and English composition, also in the use of the Binet-Simon diagnostic tests of intelligence, of Healy's tests for mental classification, and of numerous other scientific measurements of efficiency, e.g., tests of vision, hearing, strength, endurance, range of attention, suggestibility, inventiveness, ability to learn, to report, etc. Some acquaintance with general psychology is presupposed. The work is based on Whipple's Manual of Mental and Physical Tests.

F. **Elementary Education.** This course is designed for those who wish to make, during one or more summer sessions, an advanced scientific study of elementary education, in both its theoretical and its practical aspects. The course is to be taken as a unit, but for convenience is divided into three parts. Daily, except Saturday, 8.10–9.45 East Hill School. Credit, three hours.

1. **Theory of Special Methods** in the several elementary and beginning high school studies. Superintendent BOYNTON. 8.10–8.45.

2. **Observation in the Teaching of these Studies.** 8.45–9.15.
   First and second grades, teacher MARY A. DODD
   Third and fourth grades, teacher CATHERINE A. KELLY.
   Fifth and sixth grades, teacher ALICE P. SHEFFER.
   Seventh and eighth grades, teacher FANNY C. WHITE.
   Beginning high-school subjects in the seventh and eighth grades, teacher LAURA C. MANLEY.

3. **Discussions and Conferences** upon the work and observation will be conducted by Superintendent BOYNTON. 9.15–9.45.

For students in elementary education who desire to prepare for the State examinations for First Grade or for State Certificates, or who wish to continue their professional education, the following courses are available and closely correlated with the work in elementary education: Educational Psychology, Principles of Education, School Hygiene, Mental and Physical Tests of School Children, History of Education, School Administration. Further, in the various departments there are courses arranged with special reference to teaching the respective subjects.

G. **School Organization, Administration, Supervision, and Management.** Credit, two hours. Except Sat., 9. G. S. 142. Superintendent ELSON.

This course is intended primarily for superintendents, principals, vice-principals, supervisors, head assistants, critic teachers, executive officers, and in general for teachers holding or preparing for supervisory and executive positions.

The course will deal primarily with the newer and more complex problems of school administration, and will include the following topics.

The widening conception of the school as a social institution; the growing diversity in education and expanding activities of the school; varying com-

munity needs; varying needs of children; the increasing cost of education; school accounting and reporting; value of comparative tables; standardization of educational equipment and educational supplies; budget making.

The course of study; standardization of studies; time schedule; new standards of measuring efficiency; school waste; the problem of withdrawal, retardation, repetition, and non-promotion; methods of promotion; determining failures by studies and by grades; tests of efficiency in instructing; simplifying the elementary school course; increasing opportunities for practical training.

Some attention will be given the following topics; school organization; method of appointing and promoting teachers; the merit system; service-record data; salaries; pensions; method of promoting growth of teachers in the service.

H. **Physical Education. Folk and National Dances, School Games.** Two sections will be formed of teachers wishing to take up either or both of these lines of work. One section will be for those without previous training, and the other for teachers with preparation for more advanced work. Credit, one or two hours. Except Sat., 4–5.30. Sage College Gymnasium. Miss SAMETH.

The work of this department is aimed to give a practical knowledge of some of the games and folk and national dances suitable for use in both elementary and high schools as well as in playgrounds.

Materials will be selected largely from the lists of games and dances approved by the New York Public Schools' Athletic League and those suggested by the syllabus now in use in the New York City public schools.

Gymnasium costume or dancing skirt and soft slippers (without heels) will be advisable.

Games 4.00–4.40; dancing 4.50–5.30.

In addition to the class work indicated above, Miss Sameth will give individual advice and instruction, at hours to be arranged by appointment, on any matters of individual training or problems of teaching. She may be consulted at the office in the Sage Gymnasium 3.00–4.00 p. m. daily except Sat.

I. **Industrial Education.** Lectures and conferences treating the correlation of practical work with the study of methods and principles in this field. Except Sat., 12. G. S. 142.

For full description of course, and for details of the many other courses in this department, see pages 48 to 53.

J. **The Teaching of English.** See courses under English, page 16.

K. **The Teaching of Latin.** See courses on page 21.

L. **Teachers' Course in Mathematics.** See courses G and H, pages 29, 30.

M. **Physics for Teachers.** See courses 7 and 10, pages 31, 32.

N. **The Teaching of Music.** See pages 24–29 and special pamphlet.

O. **The Teaching of Geography and Geology.** Nearly all courses are pedagogical. Pages 36 to 44.

P. **The Teaching of Biology.** See under Botany, Zoology, and Physiology.

Q. **Drawing for Teachers.** See page 52.

In addition to these courses there are many others not specially enumerated here in which a large portion of the time is devoted to the pedagogical aspects of the subject. In fact, all the work of the session is arranged primarily to meet the various problems of teachers, and even in the elementary courses the best form of presentation of subject matter receives attention and illustration.

PSYCHOLOGY

A. **Introduction to Psychology.** G. S. Room C. Credit, two hours. Except Sat., 9. Professor BAIRD.

This is a lecture course, supplemented by experimental demonstrations. It is intended to serve as a general introduction to the study of psychology from the experimental point of view. The following topics will be discussed: sensation, affection, attention, perception, ideation, emotion, action.

B. **The Psychology of Memory, Imagination, Learning, and Reasoning.** G. S. Room C. T Th., 11. Professor BAIRD. Credit, one hour.

C. **Introductory Laboratory Course.** Psychological Laboratory, Morrill Hall. M W F., 10.00–12.30 (or by special arrangement, 2.30–5.00). Professor BAIRD, Mr. RUCKMICH, and Mr. FOSTER. This course is intended to familiarize the student with the observation, under standardized conditions, of typical mental processes. Credit, two hours.

D. **The Psychological Basis of Music.** Morrill Hall, Lecture Room. T Th., 12. Mr. RUCKMICH. This course attempts to outline the aesthetic effect of the various scales, of final tones, and of the intonation of musical intervals: it reviews the facts and theories of melody, rhythm, consonance, and harmony; and it summarizes the recent literature on tests of musical ability. The lectures are not technical. They are intended for those whose interests lie in the fields of psychology and music. Credit, one hour.

E. **Advanced Work in Psychology.** Morrill Hall. Hours and credit to be arranged. Professor BAIRD. Essays, discussions of assigned reading, laboratory studies.

ENGLISH

A. **Composition.** Credit, two hours. Two sections: except Sat., 8. G. S. 164. Dr. MONROE; except Sat., 11. G. S. 162. Dr. BROUGHTON.

A practical drill, intended for those who lack proficiency in writing: frequent short themes and several longer papers, expository, descriptive, and narrative; discussion of the elements and forms of discourse; weekly personal conferences at hours to be appointed.

B. **Introductory Course in Literature.** Except Sat., 8. G. S. 160. Credit, two hours. Dr. BROUGHTON.

Four modern novels and selected lyrics. This course is approximately equivalent to one-half of the first term of course 1 in the regular University session; course B and course A (see above) will together be considered the equivalent of one term of course 1.

C. **The History of the English Language.** Except Sat., 10. G. S. 164. Credit, two hours. Dr. MONROE.

A study of the development of the language to the present day, its vocabulary, sounds, inflections, and constructions, foreign influences, and allied topics. Special attention is given to the practical bearing which the historical study of the language has upon its present form, written and spoken. Recitations and lectures; collateral reading.

D. **American Literature.** Except Sat., 10. G. S. 156. Credit, two hours. Dr. BAILEY.

Introductory lectures on the colonial and revolutionary periods; recitations on nineteenth century authors. Text: Page's Chief American Poets.

E. **Teachers' Course.** Except Sat., 8. G. S. 156. Credit, two hours. Dr. BAILEY.

Designed for those who are teaching English, or who expect to teach the subject. Methods of treating the books required by the College Entrance Board; discussion of related topics in composition and in grammar. This course is open to advanced students only, and may not be used as a preparation for college entrance examinations.

F. **Shakespearean Tragedy.** Except Sat., 12. G. S. 160. Credit, two hours. Assistant Professor ADAMS.

A study of Shakespeare as a writer of tragedy, with special reference to Romeo and Juliet, Hamlet, King Lear, and Macbeth. A. C. Bradley's Shakespearean Tragedy will be used as a textbook. Designed for advanced students, and primarily for those who intend to teach the Shakespearean drama.

G. **The Tudor-Stuart Drama.** Except Sat., 9. G. S. 160. Credit, two hours. Assistant Professor ADAMS.

A rapid survey of the English drama from its beginnings to 1642, with readings of representative plays. Designed as a general introduction to the study of Shakespeare and his contemporaries.

H. **Shakespeare.** Except Sat., 9. G. S. 162. Credit, two hours. Professor STRUNK.

Lectures and recitations upon twelve plays chosen to illustrate the development of Shakespeare's dramatic art. The Cambridge Shakespeare, edited by Neilson, is recommended.

I. **Nineteenth Century Poetry.** Except Sat., 11. G. S. 156. Credit, two hours. Professor STRUNK.

A survey of the work of the great poets of the early nineteenth century: Wordsworth, Coleridge, Byron, Shelley, and Keats, with incidental discussion of the work of Tennyson and Browning. Textbook, Page's British Poets of the Nineteenth Century.

Graduate Work. The courses outlined above are undergraduate courses. Graduate students who wish to pursue work in English are cordially invited to correspond with any of the members of the staff who are engaged in instruction during the Summer Session. The work in question will consist of investigation carried on under the personal direction of one or more of the instructors. Gradu-

ate students are advised to obtain from the Dean of the Graduate School a copy of the Graduate School Announcement.

SPEAKING AND READING

In all the courses described below, individual instruction will be given by appointment. In this way the particular needs of each student, however varied they may be, can be met. No fees will be charged for this special instruction.

A. **Public Speaking.** Except Sat., 8. G. S. 21. Credit, two hours. Assistant Professor EVERETT.

A practical training for speaking in public. Original speeches and selections; extemporaneous speeches. Methods of preparing will be discussed and illustrated. High-school teachers will find the methods applicable to their work. Regular students passing this course will be admitted to the work of the second term in Public Speaking, course 1b.

B. **Voice Training.** Except Sat., 9.30 (half-hour periods). G. S. 21. Credit, one hour. Mr. FALLIS.

This course consists of exercises, both physical and mental, for the development of pure tone, flexibility and strength of voice, clear enunciation, and for relief from high, strained tones, harshness, throatiness, and speakers' sorethroat. The closely related subject of ease of action will also receive attention. The training is as valuable for the use of the voice in conversation as in public speaking and reading.

C. **Extemporaneous Speaking and Debating.** M W F., 10. G. S. 21. Credit, one hour. Assistant Professor EVERETT.

An advanced course, open to qualified students with consent of the instructor. Speeches based upon prepared outlines and briefs.

D. **Oral Reading.** Except Sat., 11. G. S. 21. Credit, one hour. Mr. FALLIS.

This course is designed especially to help teachers of literature, but is open to all students. The first part of the course will be devoted to the elements of reading—attention and individualization and sequence of ideas. The second part will be given to the oral interpretation of great pieces of literature. Each member of the class will prepare individually at least one selection.

FRENCH

A. **First-Year French.** Grammar, reading, composition, and conversation. Except Sat., 8 and 12. G. S. 283. Professor OLMSTED. University credit, four hours. Entrance credit, one unit.

The object of this course is twofold; first, to give to beginners a thorough drill in the essentials of French pronunciation, grammar, and reading; second, to offer to teachers an opportunity to study methods of presentation of these subjects to beginners. Particular attention will be given to the subject of French pronunciation, and the conversational method of instruction will be employed as largely as possible. The entire subject of elementary French grammar will be completed, and the reading of easy texts will be begun. By supplementary reading after Summer School the beginner can prepare himself for the fall examination in

Second-Year French, or he may complete the work for the second unit by taking in the University a special course three hours a week throughout the fall term.

Teachers who follow this course are recommended to take course D in connection with it.

B. **Second-Year French.** Grammar review and reading. Fraser and Squair's Abridged French Grammar; Mansion's Extracts for Composition; Laurie's Mémoires d'un Collégien; Pailleron's l'Étincelle; Labiche's la Grammaire. Except Sat., 8 and 12. G. S. 281. Mr. DALE. Credit, four hours. Entrance credit, one unit.

This course is intended for those who have had one unit of preparatory school French or its equivalent. There will be a thorough review of the syntax and of the irregular verbs, and three or four hundred pages of French texts will be read.

C. **Third-Year French.** Anatole France's le Livre de mon Ami (Guerlac); Quelques Contes des Romanciers Naturalistes (Dow and Skinner); Augier's le Gendre de M. Poirier; Voltaire's Zadig; François' Advanced Prose Composition. Daily, 8 and 12. G. S. 277. Assistant Professor GUERLAC. Credit, five hours. Entrance credit, one unit.

This course is intended for those who have had two units of preparatory school French, or one year of college French. Students taking this course are expected to devote their entire time to the subject.

D. **Teachers' Training Course.** Lectures and discussions. M W., 9. G. S. 283. Professor OLMSTED. Credit, one hour.

Careful attention will be given to French pronunciation, to the value of phonetic transcription and other devices for the teaching of French pronunciation, to methods of teaching French grammar, to the general questions of translation, dictation, and the reading of French, to the best method of awakening literary interest in students, and, in short, to all those pedagogical difficulties that beset the teacher of French.

E. **Explication de Textes.** A course for teachers and advanced students. Th S., 9. G. S. 283. Mr. DALE. Credit, one hour.

Representative works of the nineteenth century, both prose and poetry will be explained and criticized.

F. **Lectures in French.** Les grandes époques de la littérature française. T F., 9. G. S. 281. Assistant Professor GUERLAC. Credit, one hour.

This course of twelve lectures is intended for teachers desiring to hear French spoken, as well as for all those who desire to get a rapid survey of the history of French literature.

SPANISH

A. **First-Year Spanish.** Spanish for beginners. Grammar, translation, reading, composition, and conversation. Olmsted and Gordon's Spanish Grammar. Elementary readers and texts. Daily, 8 and 12, and three additional hours a week to be arranged. G. S. 290. Assistant Professor GORDON. Credit, six hours. Entrance credit, one unit.

The object of this course is to afford to those who have had no Spanish an

opportunity to acquire the essentials of the grammar, to learn to translate easy Spanish readily, to read Spanish as Spanish intelligently, to understand spoken Spanish, and to acquire sufficient vocabulary to be able to converse on topics of daily life. Spanish will be spoken, as far as feasible, in the class room.

There will be twelve prepared recitations a week; the three additional hours will be devoted to conversation, dictation, and written grammatical exercises.

After successfully completing this course, the students will be far enough advanced to be able, by supplementary study and reading to prepare themselves for the fall entrance examination in Second-Year Spanish, or they may pursue the second-year Spanish course in the University.

GERMAN

A. **First-Year German.** Grammar, translation, conversation, and composition. Textbooks: Vos's Essentials of German and Hewett's German Reader. This course affords an opportunity for those who have had no German to master the essentials of grammar, to acquire facility in the translation of easy German and to begin conversational work in the language. Two recitations will be held daily except Saturday with sufficient time between the two for the preparation of the second lesson. After successfully completing this course, students can, by supplementary reading during the summer, prepare themselves for the fall entrance examination in Second-Year German, or they may take the second-year German course during the first term of the regular college year. Daily except Sat., 8 and 12. G. S. 183. Assistant Professor POPE. Professor Pope will be in room 182, T Th., 9 to give special assistance to members of this class. University credit, four hours. Entrance credit, one unit.

B. **Second-Year German.** Rapid review of the essentials of grammar and more extensive work in translation, composition, and conversation. Two recitations will be held daily except Saturday with sufficient time between the two for the preparation of the second lesson. Textbooks: Vos's Essentials of German and Hewett's German Reader. Prerequisite: one year of high school German or its equivalent. Those who do not present certificates showing the completion of one year's work in German will be required to take a test at the beginning of the course. This course is equivalent to the second year of high school German and its completion entitles the student to a second unit of entrance credit in German. University credit, four hours. Daily except Sat., 8 and 12. G. S. 177. Mr. ZINNECKER. The instructor will be in room 178, T Th., 9, to afford special assistance to members of this course.

C. **Third-Year German.** Freytag's Journalisten, Schiller's Wilhelm Tell, Goethe's Hermann und Dorothea. The purpose of this course is to enable students who are deficient in the advanced requirements for admission to make up by extra work the entire amount required. Two recitations a day will be held, with a sufficient interval to enable the student to prepare for the second recitation. Students electing this course are expected to devote their entire time to this subject. Daily, 8 and 12. G. S. 190. Dr. THAYER. University credit, five hours. Entrance credit, one unit.

Dr. THAYER will be in attendance in room 178, T Th., 9, to afford special assistance to such students as desire it.

D. **Advanced Course in Modern German Grammar.** Except Sat., 11. G. S. 137. Assistant Professor BOESCHE. Credit, two hours.

The aim of this course is entirely practical. It is particularly intended to serve the needs of teachers of German who feel that without a thorough and fairly scientific knowledge of grammar there can be no competent teaching of its elements. The most troublesome and important questions in modern German accidence and syntax will be discussed with far greater thoroughness than is found in even the larger works on the subject. The inflection of pronouns and adjectives, the use of the cases, the employment of haben and sein as auxiliaries, the subjunctive, moods and tenses in indirect discourse, and the order of words will be among the topics treated. The outside work will include exercises specially designed for this course, assigned readings in works of reference, and the preparation of oral and written reports.

E. **Advanced Composition and Conversation.** Except Sat., 10. G. S. 190. Dr. OTTO. Credit, two hours. This course will aim to train the students to write and to speak correct German. It will be conducted as far as possible in German. Papers, based upon pictures and works of literature discussed orally in class, will be handed in regularly and corrected by the teacher. Certain hours will be set aside for instruction in elementary phonetics, if the class so desires.

[F. **Studies in the Style and Technique of the Nineteenth Century Prose Writers.** Except Sat., 9. G. S. 183. Assistant Professor DAVIDSEN. This course has a double aim. It will train the student readily to understand spoken German, and by the discussion of the peculiarities in style and technique of modern prose writers, it will cultivate in him an appreciation for the stylistic differences in modern German prose.

The time will be about equally divided between lectures in German and class room discussions. Extensive readings will be required, mostly of ordinary difficulty and largely of works that are or ought to be read in schools and colleges.]

This course will not be given in 1912.

G. **Life and Works of Goethe.** Except Sat., 8. G. S. 137. Assistant Professor BOESCHE. Credit, two hours. A comprehensive presentation of Goethe's life, work, and personality, and of the influences stimulating his development. Lectures, in German only, will alternate with discussions in which each student, while not absolutely required to use German, will be constantly encouraged to do so. The subject matter of each lecture will be announced one or two days beforehand, with references to leading biographies accessible in the library reading room. This arrangement will aid those without sufficient previous practice in listening to lectures in German. The discussions will be largely devoted to the required reading. This will comprise a considerable number of the poet's works. The assignment will vary according to the individual student, but the ability to read German rather fluently must be taken for granted. There will be no translation into English.

Erich Schmidt's six volume edition of Goethe's works will be used. (Insel-Verlag, Berlin 1909; price complete, 6 marks, $1.50). The books may be obtained in Ithaca. Bielschowsky's biography of Goethe is recommended, but will not be a required textbook. (Goethe und sein Leben, two volumes, Munich,

C. H. Beck. Price, 14 marks, $3.50. English translation: The Life of Goethe, three volumes, New York and London, G. P. Putnam's Sons, 1905. Price, $10.)

In 1913 a similar course on Lessing may be expected.

H. **German Novelists of the Nineteenth Century.** Except Sat., 9. G. S. 183. Dr. OTTO. Credit, two hours.

Lectures in German, class-room discussions, and extensive collateral reading of representative works of the following authors: Konrad Ferdinand Meyer, Isolde Kurz, Annette v. Droste-Hülshoff, Storm, Rosegger, Ebner-Eschenbach, v. Riehl, and Klara Viebig.

J. **Six Lectures in German** on popular subjects, and open to the general public, will be given on Wednesday evenings by Dr. Otto in a room to be assigned later. The following topics will be discussed: das deutsche Volkslied; deutsche Bürgerkunde; deutsche Schulreformen; die Frauenfrage in Deutschland; die Mädchenschulreform von 1911; geistige Strömungen im neuen deutschen Kaiserreiche.

In order to give additional practice in speaking and hearing German, provision will be made in the Sage College dining room for a table at which German only will be spoken, in case there is a demand for such arrangement. Teachers interested in the plan are requested to write to Professor Pope.

LATIN

The Summer Session work in Latin is intended primarily for teachers in secondary schools. The courses offered aim to secure this end in two ways: first, certain courses (A, D, E) are planned with the purpose of giving intensive consideration to the fundamental problems involved in the daily work of the secondary teacher; second, by means of advanced reading courses(B, C), the attempt is made to increase the range of the teacher's familiarity with the literature and to open up new topics of interest connected with Roman life and thought.

A. **The Teaching of Latin in Secondary Schools.** Except Sat., 9. G. S. 134. Professor BENNETT. Credit, two hours. This course will give consideration to the main topics of vital importance to the teacher in his daily work. Thus, attention will be given to pronunciation, to the reading of Latin verse, to the syntax of the Latin cases and moods, particularly of the subjunctive, to the method of teaching Latin composition, to the best method of acquiring a vocabulary, to reading at sight, to the range of reading desirable for secondary pupils, to collateral study suitable for the school. Sample recitations in beginning Latin, Caesar, Cicero, and Virgil will also be conducted by the professor in charge of the course. Those intending to take course A should bring texts of Caesar, Cicero, and Virgil.

[B. **Reading Course in Latin Poetry.** Except Sat., 10. G. S. 134. Professor BENNETT. Credit, two hours. In this course the class will read selections representing the best of Latin poetry from Lucretius and Catullus down to the later empire. The book used for this purpose can be purchased in Ithaca. Work will also be assigned in the study of the literary history and significance of the authors from whose works the selections are chosen. Each member of the class

should bring Mackail, History of Latin Literature, or Duff, A Literary History of Rome.] Not given in 1912. May be expected in 1913.

C. **Reading Course in Latin Comedy.** Plautus's Trinummus and Terence's Andria. Except Sat., 10. G. S. 134. Professor BENNETT. Credit, two hours. The course will be supplemented by a weekly lecture on select topics in Roman life and art. These lectures will be illustrated by the lantern and will cover the topics: Roman marriage and status of women; Roman education; the Roman house; the reliefs of the Titus and Constantine arches; the Ara Pacis; Trajan's Forum and the Beneventan arch.

D. **Latin Composition.** Except Sat., 11. G. S. 134. Assistant Professor JONES. Credit, two hours. This course is designed to meet the needs of those who may desire somewhat advanced training in connected Latin writing. The work will include the re-translation of English renderings of selections from certain classical authors not usually read, with especial attention to the more difficult and unusual idioms of both languages. Opportunity will also be given for the original composition of brief papers on subjects suggested by the instructor.

E. **Cicero.** Except Sat., 12. G. S. 134. Assistant Professor JONES. Credit, two hours. Three or four of the speeches against Catiline and one of the private speeches. The first speech read will be studied intensively. Especial attention will be given throughout the course to stylistic and syntactical difficulties, and to other important problems suggested by the text. Occasional inductive exercises in Ciceronian usage. Supplementary lectures on Cicero's life, writings, and times.

HISTORY AND GOVERNMENT

A. **American Social History.** The expansion of the United States across the Alleghany Mountains, 1750–1848. Except Sat., 10. G. S. 234. Credit, two hours. Professor BRETZ.

This course deals with the exploration of the trans-Alleghany country, the movement of population into the West, Indian Wars and relations with foreign powers on the frontier, territorial acquisitions, land policy, and in general, with the social life of the new communities between the Alleghanies and the Mississippi.

B. **American Politics and Government.** Except Sat., 8. G. S. 234. Credit, two hours. Professor BRETZ.

This is a course in American history since 1868, with reference to political and constitutional development. Among the topics treated are the judicial interpretations of the fourteenth and fifteenth amendments and the constitutional questions arising from the imperial policy. Attention is paid to relations with aliens, including Chinese and Japanese, to the admission of new states and the newer state constitutions, and to other leading political and governmental questions of the recent period.

C. **Growth of the British Empire.** Except Sat., 11. G. S. 234. Credit, two hours. Professor DUTCHER.

Beginning with the sea rovers of Tudor times, the growth of English sea power and over-sea enterprises will be traced to the triumphant success of Pitt's policies on the sea, in India, and in North America; then the success of Warren

Hastings in India will be contrasted with the incompetence and failure in North America; next will be observed the rebuilding of the colonial empire by the seizure of the colonies of France and its allies, such as South Africa, by pre-emption of unoccupied regions, such as Australia, and by military aggression, as in India, during a period when the theories of laissez faire and of humanitarianism held sway in England. One-half of the lectures will be alloted to the period since the accession of Victoria in 1837. These will be devoted not merely to the history of the extension of the empire in North America, Australia, South Africa, India, and elsewhere, but rather to the study of questions of emigration, of representative and responsible government, of colonial federation, of imperial control, of governing backward races, and of the growth of imperialistic ideas.

D. **The Napoleonic Era.** Except Sat., 9. G. S. 234. Credit, two hours. Professor DUTCHER.

After a review of the early life of Bonaparte and the general character of the French Revolutionary epoch, a detailed study will be made of the career of Bonaparte, the history of France, and the history of Europe from the campaign of 1796 to the Congress of Vienna. While considerable attention must unavoidably be given to military matters, the main interest will attach to the study of the dynastic, territorial, and constitutional changes; of the completion and permanent establishment of the constructive work of the French Revolution; of the diffusion through Europe of the results of the Revolution, and especially of the powerful impulse given to the growth of the spirit of nationality.

ECONOMICS AND SOCIAL SCIENCE

A. **Principles of Economics.** Except Sat., 11. G. S. 264. Credit, two hours. Professor KEMMERER.

In this course a survey will be made of the more fundamental principles of economic science. These will be studied with particular reference to their application to current economic and social problems in the United States. The aim of the course is not only to give principles and facts, but also to train the student in the exercise of an unbiased judgment on present-day economic problems.

B. **Social Institutions.** Except Sat., 9. G. S. 264. Credit, two hours. Assistant Professor BAUER.

This course will cover the principles of social evolution, aiming to show and amply illustrate how the various physical, psychological, social, and particularly economic forces work together in shaping human institutions. A special study will be made of domestic and religious institutions, with the object of explaining the rapid changes that are taking place. Lectures, assigned readings, and discussions.

[C. **Corporations, and the Trust Problem.** Except Sat., 8. G. S. 256. Credit, two hours. Assistant Professor BAUER.

This course will take up the following subjects: (1) the corporation—its nature, organization, financial operations, and legal standing; (2) causes that have led to the formation of large corporations and trusts; (3) social benefits and evils due to trusts; (4) trust legislation. Lectures, assigned readings, and discussions.] Not given in 1912.

[D. **Money and Banking.** Except Sat., 10. G. S. 264. Credit, two hours. Open only to students who have had or are taking course A or its equivalent. Professor KEMMERER.

This course will consider the general principles of money and banking, their exemplification in American history, and their application to certain problems at present agitating the public mind, such as the increased cost of living, and the reform of our national banking system.] Not given in 1912.

E. **Accounting.** Except Sat., 8. G. S. 264. Credit, two hours. Assistant Professor BAUER.

(a) The principles of double entry bookkeeping, including the theory of debits and credits, the analysis of the different classes of accounts, and the closing up of the ledger. (b) A discussion of balance sheets, income statements, the accountancy of stocks and bonds, cost-keeping, etc.

F. **Public Finance and Taxation.** Except Sat., 10. G. S. 264. Professor KEMMERER. Credit, two hours. Open only to students who have had or are taking course A or its equivalent.

This course will consider the principles of government expenditure, government revenue, and government debt. Particular attention will be given to present-day problems of taxation in the United States.

MUSIC

A special announcement of the Department of Music is published giving full details of all the Summer Session courses in the subject. This will be sent post-free on application to the Director of the Summer Session.

Staff of Instruction: HOLLIS DANN, Professor of Music, Cornell University; THOMAS TAPPER, Lecturer, Institute of Musical Art, New York; LAURA BRYANT, Director of Music, Ithaca Public Schools; ARTHUR J. ABBOTT, Director of Music, Buffalo, N. Y.; JOHN JEROME HAYES, Teacher of Singing, New York; NEWTON SWIFT, Teacher of Piano and Theory, Boston; BERNICE WHITE, Director of Music, State Normal School, Fredericksburg, Va.; WALTER BUTTERFIELD, Director of Music, Manchester, N. H.; EDWARD FRANCIS JOHNSTON, Organist, Cornell University.

Preparatory-year courses are designated A. First-year courses are designated B. Second-year courses are designated C. Third-year courses are designated D. All classes meet in Barnes Hall. Lectures in the afternoon are in Sage Chapel.

Courses for Supervisors of Music

These courses are primarily intended for the training of supervisors and special teachers of music in the public schools. The time required for the completion of the work depends on the ability and capacity of the student and upon the amount and quality of training which the student has had previous to entrance.

Students who are proficient in sight reading, ear training, piano playing, and singing, and who pass the examinations for the preparatory and first-year courses, may thus complete the work in two Summer Sessions. Others will find it necessary to attend three or four Summer Sessions with a considerable

amount of study at home during the academic years between them. Full and detailed information in regard to this home study may be had on application to Professor Hollis Dann, Ithaca, N. Y.

Courses for Grade Teachers

The probability is that the near future will witness a requirement made by school boards and state boards of education, demanding that the grade teacher shall qualify in music as she must qualify in every other subject in the elementary curriculum. Such a requirement is already in force in several states. This makes a special course of music for grade teachers an actual necessity.

In offering work for grade teachers, Cornell University is the first to place at the grade teachers' disposal, a practical opportunity for thorough preparation in the subject of public school music. A teacher who takes the preparatory-year and first-year courses and completes the work satisfactorily, will have received thorough training in sight reading, in ear training, and dictation, will have taken an elementary course in melody writing, and will have received instruction in the methods of presenting public school music. Changed conditions and the important place music has assumed in public education, make training to this extent a requisite. It gives the teacher as much freedom in her knowledge of methods and materials in music as she possesses in the subjects of geography, spelling, arithmetic, and the like.

Sight Reading—A. This is an elementary course. All that is required for entrance is sufficient aptitude and ability to pursue the subject with profit. The requirements for the completion of the preparatory-year sight reading include the ability to read at sight simple music such as is taught in the first three grades in the public schools, using the Latin syllables.

Daily except Saturday, 9.00. Miss BRYANT.

Sight Reading—B. Completion of this course requires the reading at sight of music including more difficult intervals, and also the rhythmic problems common to music taught in the first six grades of the public schools. University credit, one hour.

Mon., Wed., and Fri., 9.00. Mr. ABBOTT.

Sight Reading—C. The student is required to read at sight the music used in the upper grades of the public schools, reading words and music simultaneously.

University credit, one hour. Tues. and Thurs., 9.00, Mr. ABBOTT.

Dictation—A. (Study of Tone and Rhythm). The only requirement for entrance is a general vocal capacity for the study of music and the ability to match tones.

The subject matter of music is first presented to the sense of hearing. In this course the student gains the power to think tones and to sense ryhthms, and at the same time acquires a practical knowledge of the scale and the Latin syllables used in sight reading. Daily except Saturday, 10.00. Mr. ABBOTT.

Dictation—B. (Study of Tone and Rhythm). This includes the first five years in the study of tone and rhythm.

The topics for consideration are oral and written tonal dictation, and oral and written metric dictation. Daily written lessons will be given to cultivate

the power to recognize and write phrases covering the tonal and rhythmic difficulties included in the first five years in music. University credit, one hour. Daily except Saturday, 10.00. Mr. BUTTERFIELD.

Dictation—C. (Study of Tone and Rhythm). This course includes the sixth, seventh, and eighth years of tone and rhythm study. The student is required to recognize and write any melody of moderate difficulty in both major and minor keys, including chromatics. Additional training, including the recognition and writing of music in two, three, and four parts, is also required as a part of the necessary equipment of the supervisor. University credit, one hour. Daily except Saturday, 10.00. Professor DANN.

These courses in dictation (tone and rhythm) proceed from the simplest presentation of non-metrical tone groups to phrases and periods in which aural recognition of tone, meter, and rhythm is required. The student is taught how to correlate music reading and music form with music writing.

Material—A. This is an elementary course. The work consists of the practical use and application of the subject matter studied in Ear Training A, Notation A, and Sight Reading A. Except Fri. and Sat., 11.00. Mr. ABBOTT.

Material—B. Course B is devoted to the material for the kindergarten and for the first five years in music. This course also includes the presentation of the material and methods of teaching rote songs. University credit, one hour. Except Fri. and Sat., 12.00. Miss BRYANT.

Material—C. Course C is devoted to the material for the sixth, seventh, and eighth grammar grades. The sequence of idiomatic development of the subject and the interrelation of songs and studies are emphasized. Sight reading of words and music simultaneously supplements the singing with the syllable names. University credit, one hour. Except Fri. and Sat., 12.00. Mr. ABBOTT.

The three courses in Material are given by expert supervisors. The methods employed are those used in the school room. These courses therefore become a laboratory demonstration of the material and methods used in teaching music in the public schools from the kindergarten to the high school. On Friday of each week the work is illustrated with classes of children from the Ithaca public schools. Students thereby have the opportunity of seeing the material and methods for each grade exemplified in the most practical way.

Methods—C. This course is devoted to the pedagogical consideration of music from the kindergarten to the fifth year inclusive. The work of each year is taken up in detail and all problems which confront the grade teacher and supervisor are thoroughly discussed. Plans and methods for class room work and general supervision are carefully presented.

On Friday of each week, the lesson will consist of a demonstration of the year's work under consideration, by a class of children from the Ithaca public schools. Students in this course will thus have the opportunity of observing the practical application of methods with classes of children, from the kindergarten to the fifth year inclusive. University credit, one hour. Daily except Saturday, 11.00. Professor DANN.

Methods—D. Methods D is open only to students who have completed Methods C, and is concerned with the pedagogical consideration of music in the

grammar grades. The course will deal with the details of teaching and of supervision in the upper grades.

Instruction is given in this course for the proper training and direction of the grade teacher and the interpretation of study and song material. All the problems which confront the supervisor are thoroughly considered, and a systematic plan is laid out for his guidance.

The course in Methods D is supplemented by the practical application of methods with classes of children from the Ithaca public schools, from the kindergarten to the eighth grade inclusive. University credit, one hour. Mon., Tues., Wed., and Thurs., 8.00, and Fri., 11.00. Professor DANN.

Constructive Music

Notation—A. Course A provides instruction in the elements of music. The following are taken up for study in this course: notation, the scale in major and in minor, key signatures, measure signatures, rhythm, the simpler embellishments, and the technical terms most commonly used in music. The study of notation leads in this course to melody writing, which proceeds from the diatonic phrase to the writing of phrases embodying the simplest intervals. Daily except Saturday, 12.00. Miss WHITE.

Melody—B. This course in melody writing emphasizes especially the phrase and period forms employing free rhythm, and developing the art of melody structure on a harmonic basis.

The analysis of melodies enables the student to grasp their harmonic structure. This is developed sufficiently to form an excellent introduction to the study of harmony. University credit, one hour. Tues. and Thurs., 9.00. Mr. SWIFT.

Melody and Harmony—C. The study of harmony from a given bass and a given upper part. Beginning with the study of intervals, the work includes: major scale triads; minor scale triads; triad inversions; the dominant seventh and its inversions; melody writing for two voices (simple counterpoint), and for one voice in extended form. University credit, one hour. Mon., Wed., and Fri., 9.00. Mr. SWIFT.

Harmony—D. In this course, advanced harmony is studied, from the secondary seventh chords to suspensions and modulation: (a) from a given bass, (b) from a given soprano (open position).

Harmonic analysis of compositions in four voices forms a part of the daily work. Two-part counterpoint is continued. University credit, two hours. Daily except Sat., 11.00. Mr. TAPPER and Mr. SWIFT.

High and Normal School Music

This is an advanced course to which only third year and graduate students are admitted. Courses in theory, in musical appreciation, and in chorus singing are outlined and presented in detail. The many difficult problems which confront the music teacher in the high and normal school, are carefully studied.

Some of the topics for special consideration: the school chorus, glee clubs and orchestra, classification of voices, grading and classification of high school students in music, bibliography of choral and orchestral music suitable for high

and normal schools, preparation for normal and training schools, elective courses, credits for music, and means for cultivating the musical taste and ideals of the entire school.

A prominent feature of the work of this class is a practical course in choral and orchestral conducting. Each student will be required to prepare, and will be given frequent opportunity to conduct, choral selections under the supervision of the instructor. The work will also include instruction and practice in the reading of full scores for chorus and orchestra. University credit, two hours. Daily except Saturday, 9.00. Professor DANN.

Practice Teaching

Practical use of the material for all grades, and application of methods of teaching, are required.

Each student will be given frequent opportunity for practice teaching under supervision of different members of the faculty. Classes of children from the different grades of the Ithaca public schools will be in attendance.

No student can complete the course for supervisors until he is able to demonstrate his mastery of the subject matter and methods by actual teaching. **It is highly important that each student shall have had some experience in teaching in the public schools before entering this class.** At least a year's experience as a grade teacher is invaluable and almost indispensable. University credit, one hour. Daily except Saturday, 10.00. Miss BRYANT.

Chorus

Required of all students in music.

Four periods a week are devoted to chorus singing and to instruction in the technical and interpretative elements of choral music.

Topics for special consideration: the bibliography of choral music, and the preparation and performance of choral music by classes. One of the principal objects of this course is to train teachers in the art of conducting.

Cantatas and choruses, suitable for high school, will be studied and performed by the chorus at the public recitals given by the Department of Music during the session.

Except Wed. and Sat., 3.00, Sage Chapel. Professor DANN.

Lectures

Course One. Required of all students taking the course for supervisors. Twelve lectures on the correlation of music with literature and the arts as a means of cultural attainment. Reading courses for home study are suggested. Mon. and Tues., 3.00, Sage Chapel. Mr. TAPPER.

Course Two. A course of lectures on vocal art and technique. The course will include the following topics.

Position and breath control; voice placing; vocal faults and how corrected; registers; timbre; resonance; covered or closed tones; flexibility; repertoire.

These lectures are of great practical value to music supervisors, speakers, and singers, and are therefore required of all regular music students.

Thurs. and Fri., 3.00, Sage Chapel. Mr. HAYES.

Course Three. A course of six lectures on the principles of education with an historical background.

Wed., 2.00, Sage Chapel, Professor CHARLES DE GARMO.

Course Four. Lectures on the Psychology of Music. T Th., 12. See under Psychology, page 15.

Certificates

A certificate for work accomplished is granted to all those who pass successfully the required examinations at the close of the session.

A grade teacher's certificate is granted to those who complete the preparatory-year and first-year courses and pass satisfactory examinations.

A supervisor's certificate is granted to those who complete the course and satisfactorily pass the examinations.

MATHEMATICS

Courses A, B, and C are planned for those teachers in secondary schools who wish to review these subjects. They are equivalent to the advanced entrance requirements of Cornell University and of the College Entrance Examination Board. They presuppose a ready knowledge of elementary algebra (through quadratic equations), and of plane geometry.

Credit, A, B, and C, three hours each.

A. **Advanced Algebra.** Except Sat., 9. White 9. Dr. HURWITZ. Except Sat., 10. White 25. Professor HUTCHINSON.

B. **Solid Geometry.** Except Sat., 9. White 25. Dr. MCKELVEY.

C. **Trigonometry.** Except Sat., 10. White 6. Dr. SILVERMAN; Except Sat., 11. White 25. Professor HUTCHINSON.

Courses D, E, and F are equivalent, respectively, to (a), (b), and (c) of course 5 in Mathematics, regularly given during the academic year. Course D presupposes A, B, and C; E presupposes D; and F presupposes E. The work will consist in large part of recitations from textbooks. University credit, D, four hours; E, three hours; F, four hours.

D. **Analytic Geometry.** Eight recitations each week, daily, 9 and T Th., 11. White 2. Dr. OWENS; Daily, 8 and T Th., 11. White 21. Assistant Professor CARVER.

E. **Differential Calculus.** Daily, 8. White 24. Professor SNYDER; Daily, 9. White 27. Assistant Professor SHARPE; Daily, 10. White 27. Assistant Professor SHARPE.

F. **Integral Calculus.** Eight recitations each week. Daily, 8 and T Th., 11. White 9. Dr. HURWITZ; Daily, 8 and T Th., 11. White 6. Dr. SILVERMAN; Daily, 8 and M W, 11. White 25. Dr. MCKELVEY; Daily, 9 and M W., 11. White 5. Dr. CRAIG.

G. **Teachers' Courses.** These courses are intended for actual and prospective teachers in secondary schools. They are open only to those who have already

studied the subjects, and are not equivalent to any of the mathematical courses in college entrance requirements.

Algebra. Daily except Sat., 8. White 2. Credit, two hours. Dr. OWENS.

A critical treatment of certain chapters in high school algebra, a discussion of various pedagogic methods, and consideration of such questions as correlation with other subjects.

Geometry. Daily except Sat., 10. White 21. Credit, two hours. Assistant Professor CARVER.

A brief historical survey of the development of geometry, followed by a general consideration of the logical basis of the subject, methods in making proofs and solving originals, and questions of pedagogic treatment.

H. **Projective Geometry.** Daily except Sat., 9. White 24. Credit, three hours. Professor SNYDER.

In this course the principles underlying projective forms and constructions of the first and second degrees will be carefully developed. Particular attention will be paid to the application of these principles to elementary geometry, so as to make the work helpful to teachers of this subject. No knowledge of mathematics beyond plane geometry will be presupposed.

K. **Differential Equations.** Daily except Sat., 8. White 5. Credit, three hours. Dr. CRAIG. The principal aim of the course is to develop methods of solution of ordinary differential equations, and to explain their application to physics and to geometry.

PHYSICS

All courses are given in Rockefeller Hall. Courses 7a and 7b are not given during the regular year, and University students may not receive credit for them. All other courses are given under the same numbers as during the regular academic year. Regular University students may enter these latter courses under the same conditions as prescribed in the course of instruction and credit will be allowed as indicated below.

All courses are open to teachers who can take with them profit. Those who have not had college physics are advised to take courses 1 and 5, 10, and 7 if time permits. Those who have had college physics may take courses 6, 8 or 9, and 14, and the lectures in course 1 may be attended even if not taken for credit. Teachers are entirely at liberty to take portions of courses when such an arrangement is to their advantage. Every effort will be made to adapt the work to the needs of students and to give opportunity to profit from the exceptional equipment of the laboratory.

1. **Lectures with Experiments.** This course is intended to furnish the basis found desirable for systematic courses in textbook and laboratory. Much attention has been given to the development of demonstration apparatus for this course and even those fairly familiar with the subject may find it to their advantage to attend. The subjects for 1912 will be work, energy, wave motion, light, and sound. Except Sat., 12. L. R. B. Credit, two hours. Professor SHEARER.

5. **Recitations on Course 1.** This course combines supervision of note books in course 1 with the discussion of points outlined in the lectures. Suitable prob-

lems and references will be assigned, and full opportunity for questions will be given. Except Sat., 8. Room 106. Credit, two hours. Mr. GIBBS.

6. **Recitation Course.** This course is open only to those who have completed course 1 or its equivalent. The work for 1912 will be that of the last half term of the regular year: electricity, magnetism, conduction in gases, light, and radiation. Reed & Guthe's College Physics will be used as a text. Special attention will be given to graphic methods and problems. Except Sat., 9. Room 106. Credit, two hours. Mr. GIBBS.

7. **Teacher's Course.** Especially designed to meet the needs of teachers of physics in secondary schools. The course consists of two parts (either of which may be taken alone, although it is advisable to take them together) and is intended to present the subject from the point of view of the school instead of the college. As it is given in the afternoon, it may be taken in addition to many of the regular forenoon courses.

7a. **The adaptation of demonstration work to high school teaching.** Among the topics treated will be the selection of apparatus, the operation and use of the projection lantern, experiments in various branches of physics suitable for demonstration courses, simple apparatus and the adaptation of common things to educational purposes. T Th., 2–5. Mr. GIBBS.

7b. **The equipment and operation of a high school laboratory.** The requirements of the modern course and its adaptation to the needs of the schools. This course will be in charge of Mr. J. A. WAUCHOPE, who has made an exceptional reputation in the Mechanics Arts High School of St. Paul, Minn. A high-school man is chosen for this work in order to give teachers the benefit of the experience of one actually in the field, meeting the real problems of the high school both general and technical. Books and apparatus for this work will be provided in addition to the unexcelled equipment of the University laboratory. This course will be covered in four weeks and will be given in the afternoon, in order not to conflict with other courses in physics. Laboratory 10. M W F., 2–5, and forenoons by appointment. Mr. WAUCHOPE.

8. **Recitations in General Physics.** This course is intended for students who have had the requisite elementary training in general physics and who wish to pursue the subject more in detail with a view to more advanced work in physics or engineering. The recitations are to be accompanied by work in laboratory course 14. Course 8 is the recitation work required of engineering students during the first term of the sophomore year covering mechanics, properties of matter, static electricity, and magnetism. Credit, two hours. Courses 1 and 5, or 1 and 10, or their equivalent, must precede entrance to 8. Except Sat., 8. Room 105. Mr. MOLBY.

9. **Recitations in General Physics.** Continuation of Course 8. Required of engineering students during the second term of the sophomore year and covering heat, current electricity, induced E. M. F., capacity, etc. Except Sat., 12. Room 105. Credit, two hours. Mr. MOLBY.

10. **Physical Laboratory.** This course is of special value to teachers of elementary physics and to students who desire to study more thoroughly elementary

physical principles. The available apparatus is simple but of good quality. The work includes statics, kinetics, molecular physics, heat, light, sound, electricity, and magnetism. A group of experiments may be arranged at the beginning of the term for each individual, covering as many or as few of the general divisions of the subject as seems desirable. The course may be varied to meet the needs of the students as the work progresses, since in all cases individual instruction is given. Each student will thus have the opportunity to devote his energies to a chosen part of the subject. Occasional discussions of general interest may be held covering such subjects as methods of making observations and of using them to the best advantage, desirable accuracy, computations, errors, the interpretation of data by means of curves, the theory of particular experiments.

University students having the requisite requirements for admission to course 10 in physics as given in the Courses of Instruction for the year 1912–13 may elect this course, following the schedule prescribed for regular work during the academic year. One to five three-hour periods a week. Except Sat., 9–12. Credit, one to three hours. Assistant Professor BLAKER and Mr. HOWE.

14. **Physical Experiments.** Theory and method of physical measurements. The course presupposes a thorough course in elementary physics, both in text and in lectures. It includes setting up and adjusting apparatus and the performance of fundamental experiments; a study of limitations, errors, and methods of computation; and interpretation of results, both analytically and graphically.

The apparatus available renders it possible to make accurate measurements in the different branches of general physics. A few of the subdivisions that may be covered are friction, work, power, efficiency, uniformly accelerated linear and angular motions, moments of inertia, coefficients of expansions of solids, liquids, and gases, vapor tension and vapor density, the usual determinations in heat; the study of thermometers, their calibration and comparison; a thorough study of the analytical balance, including a determination of its errors and limitations. In sound, studies may be made in resonance and interference. The work in light comprises a study of lenses, the grating, the adjustment and use of the spectrometer, and photometry of various light sources. The equipment in electrical and magnetic apparatus is such as to afford special facilities for work in electrical measurements, such as the measurement of current, electromotive force, resistance, self and mutual induction, capacity, study of the magnetic properties of iron, and the use of standard instruments.

The work, being individual, may be planned to suit the needs of the student and may cover as many or as few topics as seem desirable. Reports on all the work done, both theory and results, are to be submitted for criticism. Credit, from one to four hours. (For work outside standard courses see course 25). One to five three-hour periods a week. Except Sat., 9–12. Assistant Professors BLAKER and RICHTMYER.

18. **Theory and Practice of Photography.** The laboratory is equipped with cameras for various kinds of work such as copying, reducing, enlarging, landscape work, lantern slide making, microscopic enlargements from transparent slides, and color photography. Well ventilated individual dark rooms are provided, also commodious exposing and printing rooms. This course is intended to give a working knowledge of the ordinary photographic processes serviceable in educa-

tional work. Four lectures at dates to be announced. Laboratory practice, M W F., 2–5 Credit, two hours. Professor MOLER.

25. **Advanced Laboratory Practice.** A course in advanced laboratory, open to students who have had course 14 or its equivalent and who desire to take up special subjects for detailed study, putting much more time on individual problems than is advisable in course 14. It is intended for those who desire to do independent work and for teachers of laboratory physics in colleges. Such problems in research as can be completed in the time available may be undertaken by special arrangement. An unusually fine equipment is available for this work. This course may count toward an advanced degree. Credit varies with the amount of work done. The laboratory will be open from 9 to 12 daily except Saturday. Assistant Professor BLAKER and Professor SHEARER.

CHEMISTRY

All courses are given in Morse Hall. L. R. = Lecture Room.

The courses announced below correspond as follows to regular University courses: A to course 1; C and E to 6; C and D to 7; E (with part of F) to 12; F to 14; G to 17; H to 19; I to 20; J and L to 30; K and M to 31; N to 37; R to 65; S to 66; T to 70; U to 71; V to 75; W to 76.

The recitation and laboratory work will be arranged, within reasonable limits, to meet the individual requirements of teachers registered in the respective courses. For students wishing to obtain university credit, the requirements for admission to the courses will be the same as during the regular University sessions. For teachers not intending to have their work apply toward a Cornell degree, these requirements will not be rigidly enforced.

A. **Introductory Inorganic Chemistry.** a. Lectures. Except Sat., 12. L. R. 1. Professor BROWNE and Mr. DAVIS. The lectures deal with the fundamental theories and laws of chemistry and with the more common elements and their compounds. They are profusely illustrated by experiments. The course is primarily designed to meet the needs of teachers in secondary schools, and to that end emphasis is laid upon methods of lecture presentation and experimental demonstration. Students other than teachers must, before registering, satisfy the department that they are properly prepared to carry on the work.

b. Laboratory work. M W., 8–12, and T Th F., 9–12. Mr. WELSH and Mr. HOULEHAN. A series of experiments designed to illustrate the fundamental laws of chemistry and to acquaint the student with the properties of the principal elements and their compounds. For the benefit of teachers who may take the course especial attention will be given to methods of laboratory instruction, qualitative experiments, and the blowing of simple glass apparatus.

c. Recitations. T Th F., 8. Recitation Room B. Mr. WELSH. The recitations deal with the subject matter of the lectures and with the experimental work in the laboratory; thorough drill in the solution of chemical problems. Credit, six hours.

C. **Qualitative Analysis.** Lectures, M W F., 11. L. R. 4. Mr. LEMON. Laboratory, except Sat., 1.30–4.30, Mr. LEMON and Mr. ULRICH. An elementary course for those who have had the equivalent of course A. A study in

laboratory and class room of the methods for detecting and separating the principal bases and inorganic acids. This is followed by the analysis of various substances, either in solution or in solid form, the composition of which is unknown to the student. Considerable emphasis is laid upon the writing of equations expressing the reactions involved in the work. Credit, three hours.

D. **Qualitative Analysis.** Lectures and recitations. T Th., 8. L. R. 2. Mr. LEMON. Laboratory work for students taking courses C and D with the intention of securing the equivalent of the regular University course 7. Daily except Sat., 1.30–4.30, and M W F., 8–11. For students taking work in course D alone, afternoon periods only. Mr. LEMON and Mr. ULRICH. Credit, one, two, or three hours. 1. A study in laboratory and class room of the methods of detecting each of the important acids in the presence of the others, together with the reactions involved, followed by the analysis of more complex mixtures than those assigned in course C. 2. A comparative study in the laboratory of different methods of detecting and separating the bases.

E. **Quantitative Analysis.** Elementary. Lectures, T Th., 11. L. R. 4. Laboratory, M W F., 8–11. Credit, two hours. Dr. LUNDELL and Mr. MARSH.

An introduction to quantitative methods and the chemistry upon which these methods are based. Lectures, explanatory of the methods used, are first given; each student then performs simple analyses which involve the use of the apparatus ordinarily employed in analytical work.

Advanced work (see course F) may be taken by students who complete this course before the close of the session.

F. **Quantitative Analysis.** Advanced. Laboratory practice at hours to be arranged. Credit, one, two, three, or four hours. Dr. LUNDELL and Mr. MARSH.

This course comprises instruction in certain gravimetric, volumetric, and electrolytic methods of analysis, and in the methods of combustion analysis. The work includes the analysis of iron ores, iron and steel, slags, paints, lubricants, coal and coke, cements and cement materials, alloys, ores of copper, lead, zinc, mercury, manganese, tin, etc.

G. **Spectroscopic Chemical Analysis and Colorimetry.** Lectures, M W F., 12. L. R. 3. Laboratory practice at hours to be arranged. University credit, two hours. Mr. ANDERSON.

The lectures are devoted to a description of the instruments used in the laboratory and to a detailed discussion of spectroscopic methods. Besides spectroscopic apparatus, various types of colorimeter, polariscope, and refractometer are considered, especial stress being laid upon the principles involved in their construction.

The laboratory instruction includes the following work: the observation and mapping of emission spectra of various elements in the Bunsen flame, the oxy-hydrogen flame, the electric arc, and the electric spark; the qualitative analysis of mixtures and minerals by the use of the Krüss spectroscope and the direct vision spectroscope; the observation and mapping of absorption spectra; the examination and identification of rare earths and of organic dyes in solution by means of their absorption spectra; the calibration of spectroscopes; spectrum photography; and practice in the use of colorimeters, polariscopes, and refractometers of various types.

H. **Qualitative and Quantitative Gas Analysis.** Lectures, M W F., 10. L. R. 3. Credit, one hour. Mr. ANDERSON.

A detailed discussion of many representative types of apparatus employed by the gas analyst, and of the various methods of analysis involved in their use. Numerous simple problems are assigned which afford practice in the calculation and interpretation of the results obtained in gas-analytical work.

I. **Technical Gas Analysis.** Laboratory practice at hours to be arranged. Credit, two hours. Mr. ANDERSON and Mr. A. R. HITCH.

The analysis of gas mixtures with the apparatus of Honigmann, Bunte, Orsat, Winkler, and Hempel; the complete analysis of flue gas; illuminating gas, generator gas, acetylene, and air; the determination of the heating power of gaseous, liquid, and solid fuels, and the analysis of various substances by gas analysis methods involving the use of the different types of gas evolution apparatus such as the Scheibler calcimeter, the Hempel and the Lunge nitrometer, the Lunge gasvolumeter, and the Bodländer gasbaroscope. Within certain limits the work may be selected to suit the requirements of the individual student.

Courses H and I should be taken at the same time.

J. **Organic Chemistry.** Aliphatic compounds. Lectures and recitations. Except Sat., 8. L. R. 3. Laboratory practice at hours to be arranged. Credit, four, five, or six hours. Professor ORNDORFF and Mr. E. F. HITCH.

K. **Organic Chemistry.** Aliphatic compounds. Lectures and recitations. Except Sat., 8. L. R. 3. Credit, two hours. Professor ORNDORFF.

These lectures and recitations are the same as those of course J. Course J should be taken in preference to course K whenever it is possible.

L. **Organic Chemistry.** Aromatic compounds. Lectures and recitations. Except Sat., 10. L. R. 2. Laboratory practice at hours to be arranged. Credit, four, five, or six hours. Mr. E. F. HITCH.

Courses J and L presuppose a knowledge of elementary chemistry, and L must be preceded or accompanied by J. These courses may be taken together or course J may be taken one summer and course L the following summer.

M. **Organic Chemistry.** Aromatic compounds. Lectures and recitations. Except Sat., 10. L. R. 2. Credit, two hours. Mr. E. F. HITCH.

These lectures and recitations are the same as those of course L. Course L should be taken in preference to course M whenever it is possible.

N. **Methods of Organic Analysis.** Laboratory practice with occasional lectures. Hours to be arranged. Credit, two or more hours. Professor ORNDORFF and Mr. E. F. HITCH.

This course comprises the qualitative and quantitative analysis of pure organic compounds, and of such commercial products as alcohols, ethers, organic acids, glycerol, formalin, acetates, soaps, turpentine, rosin oils, etc.

R. **Microchemical Methods.** Laboratory practice at hours to be arranged. Credit, two hours. Mr. GAUB.

The aim of this course is to familiarize the student with the use of the microscope and its accessories, and with microchemical methods and apparatus as applied to chemical investigations.

S. **Microchemical Analysis.** Elementary course. Laboratory practice at hours to be arranged. Credit, three hours. Mr. GAUB.

Practice in the examination and analysis of inorganic substances containing the more common elements with reference to rapid qualitative methods and the analysis of minute amounts of materials.

[T. **Foods, Beverages, and Food Accessories.** Lectures. Credit, two hours. Mr. REDFIELD.

What constitute foods, and why; chemical standards for foods, and how these have been determined; general methods of food analysis; the relation of pure and adulterated foods to the public health; sterilization and preservation of foods; detection of adulterants; dietary standards, and the economic value of different foods.] Not given in 1912, but will be given in 1913.

[U. **Food Analysis.** Laboratory practice at hours to be arranged. Credit, three hours. Mr. REDFIELD.

The chemical and optical methods employed in the examination of foods, with reference to adulteration, imitation, and alteration; the examination of foods for artificial coloring matters, preservatives, and poisonous substances; a study of milk, comestible fats and oils, cereal products and starchy and saccharine foods, canned goods, jellies, etc This course may be extended so as to include the analysis of alcoholic beverages.] Not given in 1912, but will be given in 1913.

V. **Potable Water.** Lectures. Credit, two hours. Except Sat., 9. Ch. L. R. 4. Mr. REDFIELD.

Sources of potable water; how polluted; agencies at work leading to the natural or self purification of surface and ground waters, and what they accomplish; the data necessary for a decision as to the fitness of a water for household, municipal, and industrial use; the interpretation of the results of water analyses, chemical, microscopical, and bacteriological. Modern methods of water purification, disinfection, and sterilization.

W. **Water Analysis.** Laboratory practice at hours to be arranged. University credit, three hours. Mr. REDFIELD and Dr. BRUBAKER.

The methods employed for the examination of waters with reference to their fitness for household, municipal, and industrial purposes, and for the testing of filters and water purifying devices for efficiency.

GEOGRAPHY

Lecture Room and Laboratories are in McGraw Hall.

It is the purpose in this department to meet, primarily, the needs of teachers in grammar schools, high schools, normal schools, and colleges. A second aim is to provide courses of practical and cultural value to college students. The work embraces lectures, laboratory, and field instruction in physical, regional, and industrial geography.

The environs of Ithaca are rich in phenomena of geographic interest. Consequently field excursions are made a feature of the Summer Session. (See outline of field studies below.)

The laboratories are well equipped with apparatus and illustrative material for class instruction and research. As such may be enumerated teaching and

reference collections of minerals, rocks, fossils, maps, photographs, models, and more than five thousand lantern slides.

In addition to the regular courses, special lectures will be given by different members of the instructing staff and by others who are particularly and personally acquainted with certain topics. Among these topics are: the settlement of the West, irrigation, glacial Alaska, the Mississippi delta region, phenomena of Yellowstone Park, conservation of forests.

For course of special field trips see page 40.

For excursion to Newfoundland see page 42.

A. **Physical Geography.** An introductory course in general physical geography, covering most of the subjects treated in modern texts, except the atmosphere (see course B). Some of the topics discussed are: principles of geography; structure and form of the earth; relief features; the ocean, its basins, deeps, islands, composition, temperature, movements, exploration, life, and navigation; shore line types, development, harbors; rivers and valleys; plains and plateaus, mountains; snow fields and glaciers; volcanoes and earthquakes. An attempt is made to describe the leading processes, to account for the land and water forms, and to show their consequences. The lectures are fully illustrated by lantern, maps, models, and specimens. Persons taking this course are advised to take also the related courses B, C, and D. Geological Lecture Room, M T W Th., 9. Professor CONDRA, Dr. VON ENGELN. Credit, two hours.

B. **Physical Geography, Laboratory Course.** There will be two divisions in this class, the first comprising all those who desire university credit for their work, the second including teachers and others who are desirious of gaining an acquaintance with the laboratory methods and materials of physical geogrophy. The members of the first division will do regular, systematic work following the Tarr and von Engeln Outlines for Laboratory Work in Physical Geography. The teachers' division will consider problems in the laboratory presentation of various topics, and will in general be adapted to the individual needs of the students. Among the laboratory subjects are: the interpretation and use of topographic maps, experiments in the wet laboratory illustrating erosion, stream transportation, deposition, valleys, flood-plains, alluvial fans, deltas, etc.; the location and characteristics of the physiographic provinces of the United States, topical consideration of volcanoes, glaciers, coast-lines, etc.

Physical Geography Laboratories, T Th., 2–4. Other periods to be arranged if necessary. Credit, one hour. Assistant Professor BENGSTON.

C. **Physical Geography, Field Course.** This work includes one Monday afternoon excursion each week, three Saturday excursions, and two or three longer two-day voluntary excursions, all under careful supervision and devoted to specific studies of physiography and geography in the field. The subjects are: mantle rock and bed rock structures; weathering; the work of streams; river forms in different stages of development; waterfalls; Cayuga Lake and its shore line; typical glacial deposits, including moraines, drumlins, kames, eskers, and outwash plains; the physiographic history of the Ithaca region. Persons not familiar with physical geography should read an elementary text on the subject before coming to the Summer Session, as time limitations make it necessary to presuppose some acquaintance with the subject on the first excursions. Those

desiring credit must make field notes and written reports. Excursions 1–6 inclusive are required of all students in course C; in addition they must make either two of 7, 8, or 9; or one of 10, 11, or 12 for one hour's credit.

Conducted by Professor CONDRA and Assistant Professor BENGSTON.

MONDAY AFTERNOON EXCURSIONS

Outlines of Excursions in Physical Geography by Tarr, von Engeln, and Rich are used.

1. **Physiography of the Campus and Immediate Vicinity.** The work of streams and the development and form of valleys. Influence of structure, slope, volume of water, sediment, etc. in determining the nature of a stream course. Excursion No. 1 in outlines.

2. **Eagle Hill.** To become acquainted with the lay of the land about Cornell. The broader physiographic features of the region; the maturely dissected plateau, the lake valley, the lake delta. Excursion No. 2 in outlines.

3. **Fall Creek and Deadhead Hill.** To study the origin of sedimentary rocks and the stages of valley form. The cyclic nature of physiographic changes. Weathering, erosion, and transportation. Deposition and cementation. Excursion No. 4 in outlines.

4. **Shore of Cayuga Lake.** To study shore line phenomena. Wave form and movement; effects of wave erosion and transportation; the filling of lakes and the accompanying formation of strata; influence of stream action in lake filling; the resulting shore forms; nature and origin of joint planes; formation of stalactites. Excursion No. 5 in outlines.

5. **North Spencer.** The Susquehanna Divide. To study the characteristics of a typical terminal moraine; its dissection by postglacial streams, its relation to the preglacial Cayuga Valley; overflow channel and outwash deposits; cultural adaptation to topography and streams. Expense for this excursion (others have no expense), about $1.10. Excursion No. 17 in outlines.

6. **Six Mile Creek.** To study the effects of glaciation on a stream course. Evidence of interglacial gorges; diversion of stream by moraine deposits; valley form in drift and bed-rock; influence of the conditions on the questions of water-supply and water-power. Excursion No. 15 in outlines.

ALL-DAY EXCURSIONS

7. **Cayuga Lake** by steamer, to study the deltas now forming in the lake; the Devonian strata of the lake shore, their fossil content and variations in structure; the folding of the rocks; the joint planes; the Taughannock gorge and falls; the salt works; and Portland cement works. Expense about $.75. Excursion No. 3 in outlines.

8. **Enfield** by wagon, to study the preglacial valley; interglacial gorge; postglacial gorge; influence of hard layers on valley form; influence of joint planes; elevated deltas; lateral moraine of Cayuga Lake lobe of great ice sheet; hanging valleys; glacial erosion. Expense about $1.10. Excursion No. 19 in outlines.

9. **Freeville** by wagon, to study the upper Fall Creek valley; its change from a young lower course to a mature upper course; the extension of the terminal moraine across the valley; characteristics of eskers, of kames, and of outwash plains; the relation of these deposits to the moraine; influence of glacial deposits on agriculture. On this excursion a visit to the George Junior Republic is usually made. Expense about $1.10. Excursion No. 20 in outlines.

LONGER VOLUNTARY EXCURSIONS

10. **Niagara Falls.** The two plains; the rapids; the cataract; the gorge; the buried gorge; the whirlpool; the abandoned fall at Foster Flat; the lower river; the strata of the gorge; the beaches of higher level of Lake Ontario; the origin and history of Niagara; the influence of Niagara on industry. Opportunity will be afforded to visit the immense power plant and some of the factories that have developed near the falls. (Friday and Saturday.) Excursion No. 16 in outlines.

11. **Watkins Glen.** By railroad or automobile. Moraines and through valleys. A study of Watkins and Havana Glens, which are among the most beautiful in the country; a consideration of their cause. A comparison of Seneca and Cayuga lake valleys. Influence of these valleys on the industrial development of the region. Contrast with the upland. (Friday and Saturday.) Excursion No. 6 in outlines.

12. **New York City.** Glacial plains, non-glaciated areas, anthracite coal region, Appalachian mountains, Palisades, New York City. This excursion is planned for western students but will not be run unless the registration is fifteen or more. (Friday and Saturday.)

D. **Meteorology and Climatology.** Lectures, laboratory work, and field observations; designed to meet the needs of teachers of physical geography; offers suggestions as to subjects of meteorological study that come within the scope of facilities afforded by public schools; where and how meteorological and climatological data may be obtained for school use; acquaints the student with the general circulation of the atmosphere; the development, progression, and conditions that attend cyclones, hurricanes, tornadoes and special storms; the construction of weather maps and climatological charts; practical weather forecasting from weather maps and from local observations; use and care of meteorological instruments; general and special climatology and its relation to agriculture. Special attention is given to the practical application of the principles of meteorology as exemplified by the work of the United States Weather Bureau and other similar organizations.

Lectures, M W F., 11, Geological Lecture Room. Laboratory, W., 2–4.30. Credit, two hours. Dr. W. M. WILSON, Professor of Meteorology and Section Director of U. S. Weather Bureau.

E. **Geography in North America.** The physical features of the continent in their relation to history and industry. A summary study of the leading geographic facts of each political division and a fuller treatment of the topographic and soil regions of the United States proper, giving for each, its structure, physiographic history, topography and drainage, resources, and industrial

development. Methods of reclamation and conservation are considered in their geographical relation. Attention is given to supplementary reading and to the literature of the subject in general. The course is suited to teachers and college students. It is fully illustrated with lantern slides, maps, folios, and models. Credit, two hours. Laboratory and library periods to be assigned. Geological Lecture Room. M T W Th., 10. Professor CONDRA and Dr. VON ENGELN.

F. **Industrial Geography.** This course, suited to the needs of grade and high school teachers, is both industrial and commercial. It includes a discussion of our national resources and their conservation, and a more detailed description of certain type industries. Some of the subjects are: coal and petroleum, iron and steel, forest products, tea and coffee, the sugars, cotton, rice, wheat and flour, corn, swine and cattle, dairying. An attempt is made to trace the commercial raw materials through the various processes employed, and the successive forms assumed in their origin and manufacture into finished products. This is done by the use of illustrative materials and well selected lantern slides. Commercial values and commercial relations are discussed following the other details of each industry. Excursions are made to the cement plant, salt works, the departmental plants of the College of Agriculture, and other places of industrial interest near Ithaca. Credit, two hours. Library and museum hours to be arranged. Geological Lecture Room. M T W Th., 8. Professor CONDRA and Assistant Professor BENGSTON.

G. **Aims and Methods in Geography.** The course consists of lectures, discussions, and exercises dealing with the actual problems of the class room. The work is designed particularly for teachers in the grades. Some of the topics discussed are: geography in the lower grades; use of the textbook; illustrative material—uses and methods of collecting; outline and relief maps; field and factory trips; correlation of industrial and regional geography; simple methods of teaching earth movements, latitude and longitude, standard time, tides, winds and wind belts. One hour credit can be obtained by completing readings, reports, and examinations. Geological Lecture Room. T Th., 11. Assistant Professor BENGSTON.

Round Table Conference in Geography. There will be several evening conferences for instructors and students in geography, at which discussions of important general topics relating to the teaching of geography will take place. Some topics discussed in previous years were: nature and scope of geography, principles determining the course of study in geography, excursions, laboratory work in geography, sources of geographic knowledge.

Attendance on this course is purely voluntary, but all students in the department are invited. This free interchange of views among teachers and students is expected to throw much light on problems of teaching and on working methods.

General Lectures. A course of weekly lectures on topics of general geographic interest will be given during the session by members of the Faculty. A list of these lectures will be announced early in the session.

Special Field Course in Geography and Geology
Tramping Trips—for men only

Excursions for Geography and Geology. University credit, seven hours. Dr. VON ENGELN. To regions of varied geographic and geologic interest in New

York State and adjacent areas. This course will consist of a series of four or five excursions (as listed, tentatively, below) each covering a period of from three days to a week. The remainder of the time will be devoted to library and laboratory study of the regions covered in the excursions.

Ithaca is adjacent to regions of varied geologic structure and geographic interest, and it is therefore possible by means of this series of excursions to acquire a broad, first-hand knowledge of these subjects. By direct field observations and discussions, the student will gain a systematic appreciation of geologic history and the evolution of landscape forms in addition to a particular acquaintance with the special phenomena of the areas visited. The course is also designed to give the science teacher confidence in making field interpretations in the region of his own activities. While credit in the course meets the science requirements for the A.B. degree in Cornell University, it is expected that it will create an interest and serve as a basis for further study in the regular University courses.

The excursions will start either directly afoot from Ithaca, or by train to feasible points, tramping thence along roads and across country. The splendid exercise and open air experience of the daily tramps, combine with the informational value of the course to give it added attractiveness for summer work. Stops over night will be at hotels. Each student will pay his own expenses. Each student should be provided with strong, comfortable walking clothes, especially shoes, and a knapsack for lunches and extra clothing, a light raincoat particularly. Cameras may be taken. The leader has had charge of the photographic work on several scientific expeditions to Alaska, and will give advice on exposures, points of view, etc. A geologic hammer and collecting bag will be needed for the collection of specimens. Further detailed information from Dr. von Engeln, Department of Geology, Cornell University, Ithaca, N. Y.; whom prospective students should consult personally or by letter as early as possible and before the Summer Session opens.

Excursion No. 1. The Finger Lake Region of Central New York. To Taughannock Falls, Seneca Lake, Watkins Glen, the Susquehanna divide and intrenched river, the recessional and terminal moraines of the continental glaciation. A study of the erosional and depositional phenomena due to water and glaciers.

Excursion No. 2. The Niagara Region. Niagara Falls, Gorge, and River. The Erie and Ontario Plains. The Niagara escarpment. Paleozoic sedimentary strata. Economic aspects of the geography of the Niagara region. A study of the geologic history and physiographic evolution of a plain region, and of the human relationships involved.

Excursion No. 3. The Adirondack Region. The Mohawk Valley and Gap. Exposures of igneous and metamorphic rocks. Lake George, Lake Champlain, Iron ore deposits at Mineville. The Ausable Lakes. The summit of Mt. Marcy. Lake Placid. The Thousand Islands of the St. Lawrence River. The Ontario Shore Line. The drumlin region of northern New York. A study of the geologic phenomena of areas adjacent to and in a region of old mountains, and of physiographic features due to glaciation.

Excursion No. 4. The Wilkesbarre Region, Pa. Folded mountain structure; anticlinal and synclinal mountains and basins; water gaps; anthracite coal work-

ings at Wilkesbarre, Hazleton, and Scranton; the Pocono plateau; the terminal moraine. A study and interpretation of the various geologic and physiographic aspects of a region of folded structure with a complex history of uplift and denudation.

Excursion No. 5. To be arranged according to the general interests of the class.

Newfoundland Excursion

A limited number of students will be admitted to an excursion for the study of the geology and physiography of Newfoundland, in the summer of 1912. For admission to this excursion, application must be made to Professor Tarr before June 1. University credit, seven hours. Professor TARR.

This is not a course in the Summer Session.

GEOLOGY

The Lecture Room and Laboratories are in McGraw Hall.

Courses A, B, and C are designed especially to meet the needs of teachers in high schools and normal schools, and are so arranged that they form a single group to which one may devote one's entire time during the Summer Session. The three courses combined are equivalent in a general way to Geology 1, as given in the college year, and may be taken in place of the latter by students in Agriculture. Course D is intended for teachers primarily, but may be taken by students who wish to familiarize themselves with the geology of their home regions and with the literature of geology in general. Those wishing to study a particular phase of the subject more in detail will find Course E helpful. In this course individual instruction will be given, especially in geologic and contour mapping, field problems in stratigraphy and paleontology, etc.

The abundant collections of fossils and structural phenomena in the museum, the well equipped laboratories containing teaching and reference collections of minerals, rock specimens, fossils, models, and lantern slides, together with the exceptional opportunities afforded by Ithaca for field work in geology and paleontology, all offer excellent advantages to the student.

A. **Elementary Geology.** A general introductory course. Some of the topics discussed are: general features of the earth; igneous, sedimentary, and metamorphic rocks; weathering and erosion; underground water; glaciers; oceans and lakes; structural features of sedimentary rocks; changes in level of the land; vulcanism; metamorphism; origin of the earth; the five great eras of geologic history. The lectures are fully illustrated by lantern slides, models, and specimens. The laboratory periods will be devoted to the interpretation of topographic and geologic maps, and the study of the life forms developed in each geologic era, with field excursions to collect specimens from various horizons near Ithaca, whose rocks are especially rich in fossils.

Lectures, M T W Th., 11. General Laboratory. Laboratory, F., 2–4.30, General Laboratory. Credit, two hours. Associate Professor PERRINE, and Mr. STORRER.

B. **Minerals and Rocks.** An elementary course leading to an acquaintance with the properties and more important uses of the substances forming the

earth's crust. Emphasis is laid upon the laboratory work, to which a large portion of the time will be devoted. Each student will be given about seventy-five minerals and a smaller number of rock specimens for identification by means of their physical properties. A part of the time will be spent in examining these substances as shown in the larger study collections. It is thus possible to become familiar with the more common types by actually handling many specimens of each. The laboratory fee gives the student permanent possession of a set of the minerals and a few of the more important rock specimens.

Lectures, M W Th., 10, General Laboratory. Laboratory, T Th., 2–4.30, General Laboratory. Credit, two hours. Associate Professor PERRINE and Mr. STORRER.

C. **General Geology, Field Course.** This work includes one Wednesday afternoon excursion each week, six Saturday excursions, and possibly one or more voluntary two-day excursions, devoted to specially chosen studies of geology, paleontology, and stratigraphy. For list of subjects discussed, see synopsis of excursions as given below. The excursions are open to all students of the Summer Session, but credit will be given only to those who have had the equivalent of, or are taking, courses A and B. Written reports of all excursions are required of those desiring credit. Meeting place for the first excursion, General Laboratory, 2 p. m. Credit, two hours. Associate Professor PERRINE and Mr. STORRER.

Synopsis of Field Excursions in Course C

WEDNESDAY AFTERNOON EXCURSIONS

(1) **Alumni Field and Beebe Lake.** Gulley formation; resemblances to large valleys; relations of slope, velocity, and volume; falls and rapids; effect of vegetation; stream deposits; deposition in progress.

(2) **Triphammer Falls and Fall Creek Gorge.** The gorge and its relation to the stream; effect of the falls on the rocks of the gorge; weathering and erosion; transportation and deposition; cementation; significance of unconformities.

(3) **South Hill Quarry and beyond.** Stratified rocks; joint planes, their influences; ripple marks in rocks at the quarry; glacial scratches; glacial soil. A study of the general geological features of the region as seen from South Hill.

(4) **Buttermilk Creek.** A study of gorge conditions; the preglacial valley; the interglacial gorge; the postglacial gorge and waterfalls. Enroute, the river terraces in Six Mile Creek; conditions necessary for artesian wells; the plain on which Ithaca is located.

(5) **Coy Glen.** A study of the elevated deltas; a study of their form, and the evidence of former ice dams, which held up the waters of Cayuga Lake to higher levels; influences of these deltas in causing the Coy Glen gorge to be formed; a study of the gorge and its waterfalls; comparison between the lake history of the Cayuga valley and that of the Great Lakes.

(6) **Ithaca Falls and Deadhead Hill.** Stratification and consolidation: oxidation; cementation; cross-bedding; pot-hole formation; waterfalls; the tunnel and its relation to the falls.

ALL-DAY EXCURSIONS

(7) **Portland Point Quarry by trolley.** Relation of upland topography to Cayuga Lake valley; nature of stream valleys near lake; rock structure at quarry; kinds of rock; glacial evidences; weathering; the lake and its deltas; collection of fossils from the quarry and gorge; study of the gorge.

(8) **Taughannock Falls by automobile.** A study of the upper gorge of Taughannock Creek, and the relations of the Falls to the amphitheater, as seen from above the Falls.

(9) **Salmon Creek by launch.** A study of lake deposits; weathering as shown along the lake shore en route; joint planes; the Devonian rock exposures and their fossil contents; Esty's Glen; the salt works; the Portland cement works; collection of fossils along the shores of Salmon Creek; a study of the gorge south of Ludlowville.

(10) **West Danby by wagon.** A study of the form and characteristics of a typical terminal moraine; interpretation of the principal geologic features noted en route.

(11) **Rochester by train.** The gorge of the Genesee River at Rochester, a typical lower Silurian section; collection of fossils from the various horizons; interpretation of the stratum of Clinton iron ore (hematite) glacial deposits seen en route.

(12) **Union Springs by boat.** A study of the Upper Silurian and Lower Devonian strata exposed at the lower end of Cayuga Lake; folding of the rocks; variation from shale to limestone and standstone; the gypsum beds and plaster works.

LONGER VOLUNTARY EXCURSIONS

Two-day excursions may be arranged to Niagara Falls and the Wilkesbarre coal region, if a sufficient number of students register for them.

D. **Teachers' Course in Geology.** The aims of this course are twofold: (1) to enable the teacher or student to become familiar with the literature dealing with this subject and with the geology of any region desired; (2) to outline courses adaptable for schools located in widely differing geological areas, including the selection of subject matter, laboratory equipment, textbooks, reference books, note books, etc.

Lectures and discussions, Tu., 10, and one other hour, preferably in the evening, each week. General Laboratory. Credit, one hour. Associate Professor PERRINE.

E. **Special Research and Field Work.** Work may be divided among various topics, such as: field work in making contour and geologic maps; collecting and identifying fossils from the region about Ithaca; laboratory work with fossils, minerals, and rock specimens; etc. Credit, one or more hours. Associate Professor PERRINE.

Laboratory fees: Course A, 50 cents; course B, $2.25. The fee for the term in course E is at the rate of $1.00 for every five hours a week.

BOTANY

The Lecture Rooms and Laboratories are in the southeast wing of Sage College.

The courses are especially designed to aid teachers in their work with elementary classes, and at the same time to furnish information and training to those not intending to teach.

As much of the work as is practicable will be done in the fields and woods.

Three Saturdays during the session will be devoted to excursions to study special types of vegetation.

I. Aquatic vegetation, Myers's Point, July 20. Expense about fifty cents.

II. Peatbog and marl-pond vegetation, West Junius, July 27. Expense about two dollars.

III. Ravine and woodland vegetation, Taughannock Gorge. Expense about fifty cents.

All students desiring credit in any of the courses in botany must participate in at least two of the Saturday excursions.

It is desirable that students taking courses C, D, E, and G, should have had some previous training in botany. Lectures in the various courses will be illustrated with photographs, lantern slides, projection apparatus, and as far as possible with living material.

A. **Physiology and General Morphology of Plants.** A general elementary course in botany. The aim of the earlier part of the work will be to familiarize the student with the general principles underlying the processes of absorption, nutrition, growth, etc., in plants, as well as with the methods of performing experiments to illustrate these phenomena. The latter part of the work will be devoted to a comparative study of the form and reproduction of representative species of all the great plant groups—algae, fungi, liverworts, mosses, ferns, gymnosperms, and angiosperms. Emphasis will be placed on the homologies of the vegetative parts and organs of reproduction. Lectures, M W F., 8. Laboratory, M W F., 9–12. One oral review weekly at an hour to be fixed. University credit, three hours. Dr. McALLISTER.

See excursions announced above.

B. **Special Morphology and Identification of the Higher Plants.** A comparative study of the vegetative and floral structures of the angiosperms. Types are selected representing the various groups of the angiosperms. These will be studied from the point of view of their comparative form and their adaptation to special functions. Field studies will be undertaken for the purpose of illustrating and amplifying the work done in the laboratory. Excursions from time to time will be made to localities near by. Drawings, notes, and photographs will be utilized in connection with the course. Lectures, T Th., 8. Laboratory and field work, T Th., 9–12. University credit, two hours. Mr. BROWN.

Students taking the laboratory work in Botany A and B and desiring to take lectures in any of the other courses, will be excused from the laboratory during the necessary hours.

C. **Morphology and Classification of the Cryptogams.** a. The morphology and classification of the green algae. A course in the collection and identification

of algae and a study of some of the life histories in the laboratory. Practise will be given in the various modes of preserving algae. The algal flora of Ithaca and vicinity is especially rich.

b. Embryology. Properly prepared students may make a study of certain phases of the embryology and development of typical plants of the above groups, or of the gymnosperms or angiosperms, if found desirable. Work will be assigned to suit individual needs.

All students taking this course will be required to join excursions II and III. Lectures, M W., 12. Laboratory and field work, M W., afternoons. Dr. McALLISTER. Credit, two hours.

D. **Trees and Shrubs. (Taxonomic and Biological Study of Trees.)** The tree as an organism which has adapted itself to special conditions in nature. In studying the kinds of trees, their adaptation to special conditions will be kept constantly in view. Much of the work will be done in the field. The sylvan conditions in the immediate vicinity of the University afford a fine opportunity for acquiring familiarity with many kinds of trees growing under a variety of conditions. A brief study of the structure and development of wood will also be undertaken. Excursions II and III are required. Lectures, T Th., 2.30. Laboratory and field work T Th., afternoons. University credit, two hours. Mr. BROWN.

E. **Ecology of Plants.** A study of the relation of plants to their environment, including the following topics: adaptations, both external and internal; environmental factors; sequence and growth in plant societies; training in ecological methods. Lectures, laboratory, and field work. Frequent short excursions will be made. Special attention will be given to teachers of nature study who desire to obtain more information regarding the adaptations of plants. Students having sufficient preparation may elect some special problem in histological ecology. Excursions I and II are required. Lectures, W F., 2.30. Laboratory, M W F., afternoons. University credit, two hours. Professor ROWLEE.

G. **Organography and Identification of the Higher Plants.** A study of the kinds of plants with special reference to morphology, identification, habitat, and range of species. Extra field work will be substituted for some of the lectures. An herbarium will be prepared if the student elects to do so. Excursions I and II are required. Lectures, T Th., 2.30. Laboratory and field work, T Th., afternoons. Credit, one hour. Professor ROWLEE.

ZOOLOGY

A. **General Course for Teachers.** Particular attention will be paid to the forms treated in the New York State Syllabus for High Schools. The lectures will treat of the development, systematic position, habits, and life-histories of animals. The laboratory periods will be devoted to a study of their form and structure. As far as possible every phase of the subject will be illustrated by a study of the living animal. Lectures, except Sat., 9. McGraw Hall, Room 5. Five laboratory periods, except Sat., 2–5.30. Laboratory fee, $4.00. Credit, five hours. Assistant Professor REED and Mr. GILMORE.

B. **Ornithology.** Lectures, T., 12; laboratory work, one period at an hour to be arranged and two field excursions weekly. McGraw Hall, Room 5. University credit, two hours. Laboratory fee, $1.50.

The lectures will treat of the external structures and life histories of birds. Attention will be given to such subjects as migration, coloration, molt, habit, habitat, correlation of structure and habit, and bird economy. The lectures may be taken independently or in connection with the laboratory work. Representatives of the important families of North American birds will be studied in the laboratory, with the aid of a manual. Each student should be provided with Chapman's Handbook of Birds of Eastern North America and with field or opera glasses. Assistant Professor REED and Dr. WRIGHT.

C. **Field Zoology.** Animal ecology. The course includes special preparation for field collecting and for teaching the interrelations of animals; the environmental factors of their habitat; their life histories, habits, and economy. The field trips are partially to give practice in the field observation and ready identification of animals in their natural state and partially to introduce some of the methods of ecological work. The woods, streams, the lake, hills, ravines, and marshes, all within a radius of one mile of the campus, offer exceptional opportunities to the student who wishes to become familiar with animals. The lectures will treat of the habits and relation of animals to their environment and of the literature of the general subject. Two regular field excursions each week and two or three longer trips at hours to be arranged. The number and hours of lectures each week will vary with the needs of the class. Any student in zoology or a related science is welcome to attend. Credit, two hours. Dr. WRIGHT.

PHYSIOLOGY

A. **Lectures upon the Elements of Physiology.** The lectures aim to present the fundamental facts of general and mammalian physiology, with particular reference to the functional activities of the human organism in health. The principal topics dealt with are the cell and the elementary manifestations of life, the blood and circulation, respiration, foods and their digestion, excretion, metabolism, the nervous system, and the special senses. Except Sat., 10. Stimson Hall, Amphitheater. Credit, two hours. Assistant Professor HUNTER.

B. **Elementary Practical Physiology.** A short course of demonstrations and individual experiments covering the gross and minute structure of the body, the composition of living things, blood, foods, digestion, etc. The course includes most of the experiments and demonstrations in physiology called for by the Syllabus of the State of New York. M W F., 11–12.30. Stimson Hall, Physiology Laboratory. Credit, one hour. Assistant Professor HUNTER and Mr. MAYES.

C. **Experimental Physiology.** Technical laboratory work in amphibian and mammalian physiology. The course will cover: (a) muscle and nerve; (b) heart and circulation; (c) respiration; (d) vision. Except Sat., 8–11. Stimson Hall, Physiology Laboratory. Credit, three hours. Assistant Professor HUNTER and Mr. MAYES.

D. **Advanced Work.** Opportunity for advanced work and research in physiology and biochemistry is offered to those properly qualified. The laboratories are open daily from 8 a. m. to 6 p. m.

INDUSTRIAL EDUCATION

Including courses in Manual Training, Drawing, and Handicraft

The subject of industrial education is broader than is generally assumed. It means more than the mere teaching of shop work and drawing. It suggests a scheme of education which will make it worth while for all children to remain in school, and which will provide for the children of the masses and for those who enter the great manufacturing and constructive industries something equivalent to what the state is doing for those who enter the professional and managing activities of the country.

We are all aware that many boys and girls do not have opportunity to enter employments that contribute to their development in any sense of the word, either physically, morally, or intellectually, but drift about from one unskilled occupation to another, gaining little or nothing in efficiency.

It is believed that the right sort of handwork and drawing, combined with the proper treatment of book work, will give these children the proper training to prepare them to enter some branch of actual industrial work.

Many manual-training teachers are taking this broader view of their work and its relation to the other school work, and are endeavoring to fit themselves for the field of industrial education. Some of these teachers are weak on the technical side; others fail to grasp the pedagogical phase of the work.

The growth of industrial education is significant. The program of every institute, convention, and association of school men now gives a prominent place to the subject. State laws relating to it have been passed by New York, Massachusetts, Wisconsin, New Jersey and Connecticut.

Legislative action in reference to industrial and agricultural education is under discussion in nearly every state in the Union. A great national movement along lines of education for efficiency is under way. Manual training, cooking, sewing, drawing, etc., are to become more than subjects within a school curriculum, they will be a part of a new system of education.

For such reasons the University through this department of the Summer Session offers strong courses in education, handwork, and drawing, believing that the success of this work in the past five years warrants the expansion of these courses into a well coordinated Department of Industrial Education.

Equipment

The shops and drawing rooms of Sibley College are among the largest and best equipped in the country. They are being used regularly by 1200 students and can accommodate 1500. They are at the disposal of the students of the Summer Session, who have the further advantage of seeing the regular instruction given to Sibley College students. They include a machine shop, a foundry, a blacksmith shop, a woodworking shop, and many drawing rooms, lecture rooms, etc. The shops are exceptionally well supplied with machines and tools for complete instruction in the various subjects. Within the past year the woodworking shop has been entirely reequipped and several new and expensive machines have been added to the machine shop.

A portion of the equipment has been rearranged and adapted for the special needs of teachers of manual training, drawing, and arts and crafts.

Teachers

The faculty of this department is made up as follows. 1. Teachers of shop work and drawing selected from the regular faculty of Sibley College. Every one of these men is a trained specialist and an experienced teacher. 2. Teachers of handicraft and drawing selected from the teaching corps of cities noted for their excellent handicraft work. 3. Professors in the University who will adapt their usual presentation of subject matter to the needs of teachers in schools of manual training and industrial education. 4. Lecturers on the various subjects concerned with a complete treatment of the problem of handwork in the public schools. Each of these men is a recognized authority in his special field.

Admission

The courses are open to men and women, and will meet the needs of: (a) teachers and supervisors of industrial arts, handwork, and drawing who wish to perfect themselves in technical skill and professional study; (b) men or women who have teaching experience, or who possess technical ability and wish to qualify as teachers of these subjects; (c) teachers in the State of New York who wish to qualify for the state examination in drawing and manual training as outlined by the State Department of Education; (d) school superintendents, principals of schools, and teachers who wish, through the lectures and conferences, to acquaint themselves with the methods and practices of industrial education.

There is no examination for admission to the Summer Session. Each person must, however, satisfy the instructor in charge of a course that he is qualified to pursue the work of the course. For University credit see page 7; for tuition and shop fees see page 7.

Daily Program

The shops and drawing rooms are open daily (until noon on Saturday). The lectures for this department are given between 12 and 1 every day except Saturday. Conferences will be held during the Session on Wednesday and Friday evenings. The University library is available for reading and original work by students who desire to examine the books, pamphlets, and reports referred to in the lectures and conferences.

Courses of Study

It is believed that some knowledge of the principles of education, a definite understanding of tool processes, and the ability to express ideas adequately through the art of drawing are the professional qualifications which make for efficient teaching of subject matter coming under the head of industrial education. With this aim in view this department offers three definite courses of instruction: 1. education; 2. handwork; 3. drawing.

I. EDUCATION

Development of Modern Industry. Lectures and conferences. 12–1. G. S. 142. Professor KIMBALL.

Ten lectures treating of the development of modern industry. Manufacturing processes have changed to such an extent that teachers of handwork need some knowledge of modern methods of manufacturing if they are to attempt to prepare young people for industry. Some of the topics treated will be the influence of automatic machines upon manufacturing methods, the economic problem of production and distribution, and welfare work in the modern factory.

The Problems of Industrial Education. Lectures, prescribed readings, and conferences. 12–1. G. S. 142. Principal BARKER.

These lectures will treat of such topics as: 1. the development of the teaching of mechanic arts and industrial training in our public schools; 2. the purpose and scope of the manual-training high school; 3. the relation of manual arts and drawing; 4. the present movement towards elementary industrial schools and secondary trade schools; 6. the half-time schools; 6. the apprenticeship systems; 7. continuation schools; 8. attitude of labor unions; 9. agricultural education; 10. various state laws relating to industrial and trades schools.

The Outlook for Vocational Education. The Educational Significance of the Manual and Household Arts. The Man and the Job. Three lectures by Arthur D. Dean, Chief of Division of Vocational Schools, New York State Department of Education. Mr. Dean will also conduct one or more of the evening conferences.

Evening Conferences

A series of round table conferences held each summer have proved remarkably successful in bringing together in an informal way all persons closely connected with this general field of education. The special problems of each student are taken up and discussed in the light of the combined experiences of all present. These gatherings of students, shop instructors, and lecturers will be continued this year.

The following subjects are proposed for discussion. Vocational training for the age period between 14 and 16. The problem of the technical high school. The meaning of industrial education to the elementary schools. Women in industry—a problem in industrial education. The manufacturer's point of view. The workingman's point of view. The corporation school. Normal schools for training industrial teachers. The coöperative system of education. The philosophy of industrial education in the agricultural community.

II. HANDWORK

2. **Manual Training for the Lower Grades.** A course in handwork adapted to the first six years of the elementary school. The following processes and materials will be made use of and typical projects in each will be carried out: construction work in paper and cardboard; weaving, reed, and raphia work; basketry; block printing and stenciling. simple book binding; blue printing; elementary metal and wood work. This course is offered to meet particularly the needs of the regular grade teacher, and to be of help to the special teacher of art and manual training who wishes to become familiar with the problem of handwork in the elementary grades. Except Sat., 2–4. Mr. WOOD.

3. **Wood Work for the Elementary Schools.** A course employing a comprehensive set of bench tools adapted to the upper grades of the grammar schools, each model considered with reference to form, fitness, and decoration. Methods of presentation and execution. This course is intended to equip a capable but inexperienced person for a position as teacher. Daily, 8–11. Mr. McCready.

4. **Wood Working for Secondary Schools.** A course which aims to prepare for the teaching of wood work in the secondary schools. It includes the study of joinery, furniture making, structural design, and decoration. Concrete problems involving the principles of the work will be suggested by the teacher and carried out by the class. The individual will have considerable latitude in the choice of the particular project and in its design and decoration. Particular attention will be paid to design. Except Sat., 2–5. Mr. McCready.

5. **Shop Lectures and Conferences.** Lectures and conferences on the organization and supervision of manual training, methods and materials, equipments, costs, and courses of study; practical talks on subjects of importance to the manual training teacher; woods and wood construction, lumber and forestry, wood finishing, etc. T Th., 4–5. Mr. Wood.

6. **Foundry Work.** The course begins with instruction in tempering the sand and making green sand moulds for small work. Following this come exercises in core making, and an explanation of loam work. Machine, floor, and sweep mouldings are briefly described. Castings are made in cast iron, and the students are taught to operate the cupola furnace. Mr. Vanderhoef.

7. **Forging for Secondary Schools.** This course includes systematic instruction in the use of each tool as it is taken up, the study of each material worked, with an explanation of its various grades, the proper method of treatment for each, and the discussion of the methods of making large forgings. The ground covered includes instruction in the building and care of fires, heating, drawing, forming, bending and twisting, upsetting, upsetting while bending, upsetting for square corners, punching, bolt making, welding, including careful instruction in scarfing for the various welds, the making and use of heading tools, chain making, the making and fitting of braces, the construction of hooks and ring bolts, riveting, and the use of threading tools. Training is also given in the use of the power hammer. The work in steel includes drawing, forming, welding, and tempering, and spring and tool making. Mr. Head.

8. **Machine Work for Secondary Schools.** The different measuring tools and devices, with the advantages, methods of use, and limits of accuracy of each are considered. Each cutting tool is taken up, its cutting angles and general adjustments are discussed, together with the feeds and cutting speeds suitable for each material worked and for each machine. The course includes instruction in centering, squaring, straight and taper turning and fitting, outside and inside screw cutting, chucking, reaming, finishing and polishing, drilling, tapping, mandrel making, grinding and lapping, boring, brass turning and finishing, ornamental turning, planing flat and V surfaces, fitting, the use of the milling machine, gear cutting, tool making, including taps, drills, reamers, milling cutters, and cylindrical gauges. Mr. Wells and Mr. Howe.

III. DRAWING

9. **Freehand Drawing for Elementary and Secondary Schools.** A course to meet the needs of the public-school teacher. This will include methods of drawing in such phases of the subject as the teacher must meet and in the common mediums, as pencil, crayon, and charcoal, the study of design for its public-school value, combined with talks on methods of presenting these subjects in the class rooms.

The relation of art to handwork will be considered, and the study of design will be made applicable to constructive problems. Except Sat., 8–11, Sibley 202. Mr. GRIFFITH.

10. **Mechanical Drawing for Secondary Schools.** This course is designed for those who wish to teach mechanical drawing in secondary schools and for those who feel the need of a more complete knowledge of this subject to assist them in teaching shop work. Some of the topics covered are use of instruments, lettering, orthographic and isometric projection, inking, tracing, conventions, and working drawings. Students familiar with these topics may elect a more advanced course. Sibley 102. Mr. WILLIAMS.

SHOP WORK AND DRAWING FOR ENGINEERING STUDENTS

Drawing

For further information regarding course C, apply to Mr. Pond; for information regarding the drawing and shop courses apply to Professor Kimball, 205 Sibley.

A. **Mechanical Drawing.** A course in drawing for beginners, covering use of instruments, orthographic and isometric projection, inking, tracing, conventions, working drawings, M W F., 8–11 and except Sat., 2–5. Sibley 203. Mr. WILLIAMS.

B. **Machine Sketching and Drawing.** A more advanced course in mechanical drawing for those who have had the equivalent of course A. Sketching of machine parts, machine drawing from sketches, empirical design. This course is an application of the work in course A to such machine designing as can be done without a knowledge of mechanics. M W F., 8–11 and except Sat., 2–5. Sibley 203. Professor KIMBALL and Mr. WILLIAMS.

C. **Descriptive Geometry.** Lectures or recitations, daily except Sat., 8. Drawing, daily except Sat., 9–12. Lincoln Hall. Assistant Professor POND.

Equivalent to descriptive geometry of course 1 as given in the regular college year, and accepted for the descriptive geometry required in Sibley College and in the College of Civil Engineering. Those who require Sibley credit do not need to take the whole course.

Shop Work

A. **Pattern Making.** Use of woodworking tools; elements of pattern making. Mr. HOOPER.

B. **Foundry Work.** Moulding, casting, mixing of metals, operation of cupola, etc. Mr. VANDERHOEF.

C. **Forge Work.** Forging, welding, tempering, etc. Mr. HEAD.

D. **Machine Work.** Use of measuring tools; hand and machine tools; fitting and assembling.

Each of the above daily except Sat., 8–11, 1–5, and Saturday, 8–1. Mr. WELLS and Mr. HOWE.

E. **Principles of Manufacturing.** Must be taken with course D. Theory of measuring and elementary theory of manufacturing; cost and time-keeping systems, etc. Lectures, M T W Th., 11. Sibley 105. Mr. WELLS.

F. **Manual Training.** The scope of the foregoing courses in shop work is the same as that of the corresponding courses given to the regular Sibley College students. They are intended for prospective or actual engineering students. In addition to these, special courses are offered in each shop, designed to meet the wants of manual training teachers, and given in close connection with the technical work of manual training. (See pp. 50, 51.) Teachers having special needs may have courses made up to suit their wants. At the same time it is greatly to their advantage to see the work as given to the regular engineering students.

MECHANICS OF ENGINEERING

A. **Mechanics.** This course is the equivalent of the first term of course 20, College of Civil Engineering. Admission to this course is restricted to those already having a fair knowledge of the subject. Students in Cornell University engineering courses are not admitted to this course, unless they have taken the first term of course 20, or its equivalent, in University classes during the regular University year and received a mark of at least 41.

Lectures, recitations, and problems, two hours daily except Sat., 8–10. Lincoln Hall 24. Assistant Professor RETTGER.

B. **Mechanics.** This course is the equivalent to the second term of course 20, College of Civil Engineering. The restrictions in this course are the same as in Mechanics A above.

Recitations, lectures, and problems. Daily except Sat., 10–12. Lincoln Hall 24. Assistant Professor RETTGER.

C. **Engineering Problems.** This course will be given if ten students register for it before June 10. This course is the equivalent of course 29, College of Civil Engineering. Preparation required: Mechanics 20 and Hydraulics 23 in Cornell University or their equivalents. Computations and reports. Three hours daily except Sat. Credit, two hours. Lincoln Hall 22. Assistant Professor RETTGER and ———.

BRIDGE AND STRUCTURAL ENGINEERING

C.E. 71. **Structural Design.** Credit, two or four hours. Preparation required: Mechanics 20. One half of the course includes structural details, or the design of a wooden roof truss and of other timber joints. The other half of the course includes bridge stresses in simple trusses due to dead, live, and wind loads, initial tension and impact, and for both panel loads and locomotive

axle loads. Lectures, recitations, computation, and drawing. Except Sat., at hours to be assigned. Lincoln Hall 27 and 29. Assistant Professor DERICKSON.

C.E. 72. **Reinforced Concrete Arch.** Credit, two hours. Preparation required: Mechanics 20, and that portion of course 71 which deals with elementary graphic statics. The design of an arch of reinforced concrete including the abutments and centering. Lectures, computation, and drawing. Except Sat., at hours to be assigned. Lincoln Hall 27 and 29. Assistant Professor DERICKSON.

This course will be increased to three hours credit for those who desire to substitute it for Engineering Design, C.E. 91 (f).

C.E. 77. **Concrete Construction.** Credit, three hours. Preparation required: Mechanics 20. Textbook, Principles of Reinforced Concrete Construction by Turneaure and Maurer. The object of this course is the study of the fundamental principles underlying the rational design of reinforced concrete structures including centering. Except Sat., 9–12.30. Lincoln Hall 22 and 29. Assistant Professor DERICKSON.

HYDRAULICS

The instruction in hydraulics given in the Summer School is intended primarily for students in Cornell University who have failed to obtain a passing mark in the subject during the regular term, and for those students in Sibley College who have been unable to take the work of the regular course on account of conflicts or pressure of other work. The scope of the work in the Summer Session is identical with the regular courses 23 and 24 in Civil Engineering, save that the laboratory demonstrations are omitted. For the convenience of students in Sibley College who desire to take hydraulics in the Summer Session, the work has been arranged in two parts allowing the students in mechanical engineering to omit that part pertaining to hydrostatics, and to restrict themselves to the study of the flow of water and to hydraulic motors. Students desiring the equivalent of C.E. 23, five hours credit, will take all the work, meeting eleven times a week in one-hour periods, twice daily except Saturday, and once on Saturday. Students desiring the credit of two hours for the equivalent of the Sibley requirement will meet once each day, six times a week, in one hour periods. Sibley students must receive the approval of Professor Diederichs before registering. Students who contemplate taking hydraulics in Summer Session should register in advance with Assistant Professor SEERY, 33 Lincoln. For convenience of instruction and administration the course is divided into two parts.

Course A. Hydrostatics; measurement of pressures; strength of pipes; dams and retaining walls; earth pressures; immersion and flotation; pneumatics of air motors and compressors; barometric levelling; etc. Daily except Sat., 12. Lincoln 21. Assistant Professor SEERY.

Course B. Hydraulic motors and flow of water through pipes and orifices and over weirs; fluid friction and loss of head; general applications of Bernouilli's Theorem; steady flow in open channels; use of Kutter's and Church's Diagrams; hydraulics of machinery; waterwheels; impulse wheels; reaction turbines; theorem of flow through rotating casing; power, speed, and discharge of turbines; theory of testing of motors, etc. This course corresponds exactly to C.E. 24 and the Sibley course in hydraulics. Daily, 8. Lincoln 21. Assistant Professor SEERY.

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OFFICIAL PUBLICATIONS OF CORNELL UNIVERSITY

Issued at Ithaca, N. Y., monthly from July to November inclusive, and semi-monthly from December to June inclusive.

[Entered as second class matter, August 31, 1910, at the post office at Ithaca, N. Y., under the Act of July 16, 1894.]

These publications include

Catalogue Number (containing lists of officers and students), price 25 cents,

Book of Views, price 25 cents,

Directory of Faculty and Students, First Term, 1911-12, price 10 cents,

and the following informational publications, any one of which will be sent gratis and post-free on request. The date of the last edition of each publication is given after the title.

General Circular of Information for prospective students, January 1, 1912.

Announcement of the College of Arts and Sciences, January 15, 1911.

Announcement of Sibley College of Mechanical Engineering and the Mechanic Arts, Feb. 15, 1912.

Announcement of the College of Civil Engineering, March 1, 1912.

Announcement of the College of Law, May 15, 1911.

Announcement of the College of Architecture, March 15, 1912.

Announcement of the New York State College of Agriculture, Oct. 1, 1911.

Announcement of the Winter Courses in the College of Agriculture, November 1, 1911.

Announcement of the Summer School in Agriculture, July 1, 1911.

Announcement of the New York State Veterinary College, May 1, 1911.

Announcement of the Graduate School, January 15, 1912.

Announcement of the Summer Session, April 1, 1912.

Annual Report of the President, December 1, 1911.

Pamphlets on scholarships, fellowships, and prizes, samples of entrance and scholarship examination papers, special departmental announcements, etc.

Correspondence concerning the publications of the University should be addressed to

The Registrar of Cornell University,
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